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Covering the Literature on Atomic Energy
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NP-2254	Introduction; Chapter I and Neptunium and Plutonium; Chapter X. In Atomnaya Energiya (Atomic Energy). Moscow, Leningrad, State Publisher of Technical-Theoretical Literature, 1946. E. V. Shpolskii; G. N. Kolshenko, ed.	3117
NP-2256	On Some Peculiarities of the Process of the Fission of the Heavy Nuclei; trans. from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 10, No. 4 (1946). Ya A. Frenkel.	3276
NP-2264	The Use of Differential Thermocouples for Kinetic Determinations; trans from Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk 3, 349-58(1948). Yu. B. Kagan, A. N. Bashkirov. tr. by E. Hope.	3040
NP-3007	Technical Report No. 4; Stochastic Methods in Quantum Mechanics. Gilbert W. King.	3283
NP-3021	Mechanical Models in Plasticity and Their Use for Interpretation of Creep in Concrete. Wilhelm Flügge.	3137
NRL-Trans-299	Analyzer of Motion of Gaseous Ions; Part I; trans. from J. Phys. Radium (7) 10, 177-88(1949). Paul Langevin.	3177
NRL-3715	Upper Atmosphere Research Report No. XI; A Note on the Geometry of Geiger Counter Telescopes. Homer E. Newell, Jr. and Eleanor C. Pressly.	3207
NRL-3743	The Reaction between Tertiary Amines and Organic Acids in Nonpolar Solvents. Samuel Kaufman and C. R. Singleterry.	3039
ONRL-114-50	Conference on Ferromagnetism and Antiferromagnetism, University of Grenoble, France, July 3-7, 1950. P. W. Forsbergh and P. M. Marcus.	3157
ONRL-1-51	Deformation-Testing Devices at the Cavendish Laboratory, Cambridge. Amos J. Shaler.	3178
ONRL-2-51	Infra-Red Gas Analyzers. W. Lewis Hyde.	3180
ONRL-3-51	Determination of the Scattering Constant in Photographic Emulsions. S. Fred Singer.	3251
R-200(RAND)	Molybdenum Alloys and Protection by Cladding. W. L. Bruckart, S. J. Whalen, R. I. Jaffee, and B. W. Gonser.	3152
TT-149	Internal Rotation and Rotational Isomerism; trans. from Uspekhi Khim. 13, 234-52(1944). M. V. Volkenshtein; tr. by E. Rabkin.	3218

GENERAL

ATOMIC POWER

2975

INCORPORATION OF ATOMIC ENERGY IN ELECTRIC-POWER INDUSTRY. Paul Wessel. Naturw. Rundschau 4, 95-6(1951) Mar. (In German)

A short note on fundamentals of nuclear science and on possibilities of industrial applications of atomic energy is presented.

BIOLOGY AND MEDICINE

2976

Argonne National Lab.
AN INTERRELATIONSHIP BETWEEN TIME-RETENTION CURVES IN SHORT VS. PROLONGED ISOTOPE EXPOSURES. Donald L. Buchanan. Nov. 1950. 13p. (AECU-1183; UAC-329)

A concept is presented which relates isotopic retention of an isotope in animals subjected to a "single dose" to the level of retention found experimentally after prolonged constant intake of the same isotopic compound. The mean retention time, which is easily obtained from experiments of the latter type, specifies the integral of the time-retention curve obtained in experiments of the former type and by so doing rigorously sets an upper limit to the total radiation dose that the animal may receive from the intake of a known amount of a given isotopic compound. The concept is extended to allow calculation in localized arbitrary volumes of tissue. (auth)

2977

Sloan-Kettering Inst. for Cancer Research
THE NATURE OF THE COMBINING SITES OF ANTIBODIES; THE SPECIFIC PROTECTION OF THE COMBINING SITE BY HAPTEN DURING IODINATION. David Pressman and L. A. Sternberger. [nd.] 22p. (AECU-1189)

It is reported that the antibody specific regions of antibodies homologous to the p-azobenzoate or p-azobenzenearsonate ions can be protected against destruction by iodination through combination with the homologous hapten. The protection phenomenon proves that there is a grouping within the specific region of the antibody which is altered by iodination and that the loss of antibody activity by iodination in the absence of a combining hapten is not due to an alteration of the part of the antibody molecule other than the specific combining site. The protection phenomenon can be used to define more closely the nature of the combining sites of antibodies by using a variety of agents known to combine with definite chemical groupings. Benzenearsonate ion was found to combine somewhat with antiserum homologous to the benzoate ion although such combination was not realized from hapten inhibition measurements. This indicates a possible use of the protection phenomenon to measure the combining powers of very weakly combining haptens. 21 references. (auth)

2978

Brookhaven National Lab. and Yale Univ.
COMPARATIVE STUDIES OF MINERAL CONSTITUENTS OF MARINE SPONGES. I. THE GENERA DYSIDEA, CHONDRILLA, TERPIOS. Vaughan T. Bowen and Doris Sutton. [nd.] 21p. (AECU-1198)

Analyses of Al, Ca, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, Pb, Sn, Ti, and V are presented for specimens of five species of marine sponges: Dysidea crawshayi, D. etheria, Chondrilla nucula, Terpios fugax, and T. zeteki. Analyses for F in D. crawshayi are included. It is reported that D. crawshayi is an accumulator of F, K, and Ti, that D. etheria is not an accumulator of any of the elements studied, that Chondrilla nucula is an accumulator of Cu and Na, and that Terpios fugax and T. zeteki are accumulators of Ti and to some extent of K, while the latter may also accumulate Mn, Sn, and V. One collection of D. crawshayi is characterized by an extraordinary level of Ni accumulation. It is indicated that this sort of Ni accumulation is not of infrequent occurrence in these sponge species, and that the mass of accumulated material is in extractable form. 24 references.

2979

A COMPARATIVE STUDY OF THE LIGHT AND DARK FERMENTATIONS OF ORGANIC ACIDS BY RHODOSPIRILLUM RUBRUM. Elmer F. Kohlmiller, Jr. and Howard Gest. J. Bact. 61, 269-82(1951) Mar.

The anaerobic decomposition of pyruvic acid in the dark by "normal" resting cells of the nonsulfur purple photosynthetic bacterium, R. rubrum, has been found to be a typical

propionic acid fermentation. Cells grown aerobically in the dark also ferment pyruvate with the production of CO_2, small quantities of H_2, and acetic, propionic, butyric, valeric, and caproic acids. The course of the dark fermentations by both types of cells is affected by the CO_2 tension. The light-induced decomposition of pyruvate by "normal" cells is characterized by the production of approximately equimolar quantities of CO_2 and H_2 and the absence of fatty acids as end products. After a lag period, "dark-grown" cells exposed to light ferment pyruvate in a similar manner. "Normal" cells ferment fumarate and malate very slowly in the dark with the production of CO_2 and acetic and propionic acids; lactate and succinate are not decomposed at significant rates. All four acids are rapidly fermented in the light with the formation of CO_2 and H_2. Formic acid has been found to accumulate in H_2-producing cultures growing anaerobically in the light in a malate-glutamate medium. When the nitrogen source for growth is NH_4Cl, H_2 is not produced, and formic acid does not accumulate. The significance of the results is discussed in relation to various aspects of the physiology and metabolism of photosynthetic bacteria. 22 references. (auth)

2980

Naval Radiological Defense Lab.
OBSERVATIONS ON THE THERMAL FRAGILITY OF ERYTHROCYTES. Leontine Goldschmidt and Robert L. Rosenthal. Nov. 24, 1950. 16p. (AD-275(B))

The effects of temperature upon the fragility of erythrocytes of man, guinea pig, rabbit, and rat are presented. Differences in thermal fragility of erythrocytes among these species are demonstrated and correlated with the red cell count. Some effects of mechanical trauma and ether treatment upon the thermal fragility and hypotonic saline fragility are presented. These studies suggest that a relationship may exist between the thermal fragility of erythrocytes and their susceptibility to in vivo destruction. (auth)

2981

RADIO-ISOTOPES IN MEDICINE. Tikvah Alper. S. African Med. J. 24, 1043-9(1950) Dec.

Following reference to the basic principles of radioisotope formation and theory, a discussion on the use of radioisotopes in tracer applications and in radiotherapy is presented. The distance of South African users from the sources of supply is indicated as a major problem due to exhaustion of radioactivity during shipment of desirable elements with short half-lives.

2982

SCREENING OF POTENTIAL CANCER-INHIBITING AGENTS. Maxwell Gordon, Jean B. Siri, and Jane G. Campbell. Science 113, 61-4(1951) Jan. 19. (Technical Papers)

Work on the synthesis of some thiazolinopurines related to 2,6-diaminopurine and to other purines is reported. None of the compounds prepared in this program to date showed any cancer-inhibiting action, but they are being reported in an effort to avoid duplication by other investigators. Some of the pyrimidines reported were used as intermediates in other syntheses, but they are included here since their antileukemic possibilities had not previously been explored. The customary screening procedure was carried out using C57 black mice into which had been implanted either the undifferentiated adenocarcinoma Eo771 or the myeloid leukemia C1498. Dosage of the compounds to be screened was arbitrarily set at 40% of the MLD_{10}, except in cases where the animals reacted unfavorably to this amount. The formulas, molecular structure, dosage, survival time, etc., are listed.

RADIATION EFFECTS

2983

Brookhaven National Lab.
INHERITANCE OF CORN GRASS: A MACROMUTATION IN MAIZE, AND ITS POSSIBLE SIGNIFICANCE AS AN ANCESTRAL TYPE. W. Ralph Singleton. [nd.] 27p. (AECU-1165)

The possibility that a corn-grass-type plant is the ancestor of maize has been investigated. Plants have been cultivated, and the environmental and genetic modifiers have been studied. Preliminary attempts failed to induce somatic mutations by use of β radiation from P^{32} and γ radiation from Co^{60}.

2984

Brookhaven National Lab.
HEALTH PHYSICS AND MEDICAL ASPECTS OF A STRONTIUM-90 INHALATION INCIDENT. Frederick P. Cowan, Lawrence B. Farabee, and Robert A. Love. [nd.] 12p. (AECU-1169)

A number of health physics, medical, and chemical aspects of the management of an incident in which an individual became contaminated from activity released in the laboratory during the preparation of a Sr^{90} source are discussed. The results of the analysis of the urinary elimination of Sr^{90} – Y^{90} for the period following the inhalation are presented.

2985

Brookhaven National Lab.
EFFECTS OF RADIATIONS ON BIOLOGICAL SYSTEMS. A. H. Sparrow and B. A. Rubin. Feb. 15, 1951. 94p. (AECU-1207)

An extensive review covering types of radiation, radiation dosage units, radiation energy transfer mechanisms, the "target" theory, relation between chemical and biological effects of radiation, effects of radiation on microorganisms, cytological and genetic effects, carcinogenesis, physiological and embryological effects, and factors determining radiation sensitivity is presented. The selected bibliography favors recent publications, especially reviews.

2986

Tennessee Valley Authority
WHITE OAK CREEK ECOLOGICAL STUDY ANNUAL REPORT; FISCAL YEAR - 1950. 1950. 4p. (ORO-25)

A brief report concerned principally with organization and planning is presented.

2987

THE BIOELECTRIC POTENTIAL OF SEEDS AS A FUNCTION OF GROWTH AND OF X-RAY DOSAGE. M. W. Jones, B. Kivel, and A. A. Bless. Plant Physiol. 26, 19-29(1951) Jan.

It was found that x rays, in general, decrease the bioelectric potential of plant seeds and lower their vitality. High-yielding seeds were found to have higher potentials than those of low-yielding varieties. The bioelectric potential is not a function of the weight of the seed; it is zero at dormancy and rises slowly during the first few hours in a humid environment, then it rises much more rapidly as coleoptile elongation begins.

2988

THE EFFECT OF RADIATIONS ON GALACTOZYMASE FORMATION IN YEAST. C. L. Brandt, P. J. Freeman, and P. A. Swenson. Science 113, 383-4(1951) Apr. 6.

Galactozymase formations in yeast have been subjected to radiation of ultraviolet light, visible light, and x radiation, resulting in a different reaction to each. Photodynamic action of visible light seems to be confined to the surface whereas ultraviolet light appears to strike deeper and prevents galactozymase synthesis. X rays appear to prevent division but have no effect on galactozymase formations.

2989

HEPATIC GLYCOGENESIS IN WHOLE-BODY X-IRRADIATED ANIMALS. Marguerite Lourau and Odette Lartigue. Compt. rend. 232, 1144-6(1951) Mar. 12. (In French)

Glycogenesis in the guinea pig is diminished following sublethal x irradiation. This is not due to the inability of the hepatic cell to synthesize glycogen but to the absence of substrate, the glucose in the circulation probably having been abnormally metabolized to a substance incapable of entering into glycogen synthesis.

2990

Naval Medical Research Inst., Bethesda and California Inst. of Tech.
MUTATIONS PRODUCED BY ATOMIC BOMB IRRADIATION OF NEUROSPORA CRASSA; APPENDIX NO. 16. to the Final Report. Carroll E. Wagner and G. W. Beadle. Mar. 7, 1949. 8p. (NP-1904)

Eighty biochemical mutants observed in red bread mold, Neurospora crussa, exposed to Tests Able and Baker have been classified. Of these, 32 are classified as unknowns, meaning that these mutants require for growth, compound not yet identified. No attempt was made to classify the various morphological mutants found. The numbers of recovered mutants are so small that no attempt has been made to correlate them with dosages measured by physical means at the various stations.

2991

MUTATIONS INDUCED BY CHRONIC RADIATION. B. Wallace. Paper presented at the 1950 Meeting of the Genetics Society of America, Columbus, Ohio, Sept. 11 to 14.

An abstract of this paper appeared in Genetics 35, 698(1950) Nov. and is reproduced here in its entirety.

Males and females of the ore-R strain of D. melanogaster have been subjected to chronic irradiation in a number of experiments. (1) Chronic x-ray treatment of approximately 108 r per day (7 min per treatment) for 5, 10, 15, 20, and 25 days after deposition of eggs gave, in males, 1.21 ± 0.22%, 3.99 ± 0.59%, 4.60 ± 0.42%, 6.14 ± 0.66%, and 5.20 ± 1.23% sex-linked lethals. The control rate was 0.19 ± 0.10%. The proportion of recoverable lethals increased linearly with dose for 20 days; there was no increase after that time. (2) Males and females carrying lethal-free second chromosomes were exposed continuously to γ rays for 18 days (~ 2200 r) at 25°C while they developed from eggs to adults. In all, 3772 second chromosomes from these treated males were tested for lethals; 456 (12.1 ± 0.5%) were recovered. No attempt was made to test for clusters. Likewise, 1187 second chromosomes from treated females were also treated; 69 (5.8 ± 0.7%) lethals were obtained. The difference between the frequencies of recoverable lethals in the two sexes is significant. Preliminary tests for translocations coincident with these lethals indicate that they occur with a low frequency; no translocations were coincident with the 69 lethals derived from females, 3 were present among 99 independent, "randomly" chosen lethals from treated males. A test for allelism made with 100 lethals of independent origin (obtained from different males) gave 14 cases of allelism in 4950 tests. A minimum of 400 (234-718) loci on the second chromosome are capable of mutating to lethality under these conditions.

2992

ON THE VARIATION OF PENICILLIUM CHRYSOGENUM Q 176 INDUCED BY RADIUM IRRADIATION. Shohei Otani and Hyuga Okada. J. Antibiotics (Japan) 3, 819-32(1950) Dec. (In Japanese)

To induce saltation or mutation of microbes by radioactivity, the spores of P. chrysogenum Q 176 were irradiated with radium. Germination was prevented to the extent of about 2% by 5-day irradiation. Various variants appeared by the end of this irradiation. The variation rate was 15%. From the variants the authors isolated one strain without specific yellow pigment. This strain was called "RaO." No particular variants which would yield higher potency could be obtained. The isolated variants were investigated by monospore culture and other methods as to whether they are induced by saltation or by fluctuation and also were examined for penicillin yield. It was found that variations of the color of spores and of the form of colonies were induced by saltation; variation of spore numbers was induced by fluctuation; the strains which have few spores produce little penicillin, and there were intermediate forms between saltation and fluctuation. By shake culture and tank fermentation the pigmentless strain "RaO" was found to be a saltant. It produced 470 μ/cc, the same potency as the parent strain, by shake culture. The potency in the test tank was 267 μ/cc. This strain may be a promising one. Filtered broth was always pigmentless, and the resulting amorphous penicillin was white. (auth)

2993

PATHOLOGY OF IONIZING RADIATION. Russell M. Maynard. Rhode Island Med. J. 34, 23-5(1951) Jan.

Using information from various sources, including reports on casualties of the Hiroshima and Nagasaki atomic bomb blasts, the author summarizes the effects of ionizing radiations on the tissues and organs of the body.

2994

PHOTOREVERSAL OF ULTRAVIOLET-INDUCED MUTAGENIC AND LETHAL EFFECTS IN ESCHERICHIA COLI. H. B. Newcombe and H. A. Whitehead. J. Bact. 61, 243-52(1951) Mar.

The effects of irradiation with ultraviolet (2537 A) and of posttreatment with light (mainly 3650 and 3663 A) have been studied in Escherichia coli, strain B/r, observing the amount of killing and of mutation to streptomycin resistance and dependence and to change in color response on mannitol-tetrazolium agar. With exposure to low doses of ultraviolet (500 ergs/sq mm) both the lethal and the mutagenic effects can be greatly reduced by posttreatment with light, whereas with high doses (2500 ergs/sq mm or more) the mutagenic effect becomes stable and only the lethal effect can be reversed. The proportion of mutations among the survivors is virtually the same for all doses of ultraviolet from 500 to 5000 ergs/sq mm, and it is only the photosensitivity of the effect that shows appreciable change. It is believed that a photosensitive and photostable mutagenic poison are formed within the cell by the ultraviolet. If this is the case, there would appear to be a limiting step in the reactions by which these act to cause mutation, and with high doses that produce sufficient of the mutagenic poison to saturate this reaction there can be no photoreversal of the mutagenic effect. (auth)

2995

PRODUCTION OF HYPOCHLORHYDRIA BY BETA RADIATION OF THE STOMACH. D. M. Douglas, W. R. Ghent, and S. Rowlands. Lancet 260, 492-5(1951, Vol. I) Mar. 3.

The gastric mucosa of dogs has been irradiated with β rays from an intragastric balloon containing P^{32}. Gastric secretion was studied before and after irradiation. After irradiation all the dogs showed a reduced amount of free HCl in the gastric juice. Apart from an average weight loss of 2.2 kg they maintained good health. The duration of the induced hypochlorhydria, the best dosage of β radiation, and the possibility of late carcinogenesis are being investigated. 6 figures. (auth)

2996

SOME EFFECTS OF HIGH VELOCITY ELECTRONS ON WOOD. E. J. Lawton, W. D. Bellamy, R. E. Hungate, M. P. Bryant, and E. Hall. Science 113, 380-2(1951) Apr. 6.

Basswood irradiated with high-velocity electrons shows an alteration of its structure in such a way that some of the insoluble carbohydrate components become available to rumen bacteria. Cellulose in the wood appears to be relatively unaffected by the enzymatic action of the rumen microbes, and digestibility is not increased much by irradiation up to 6.5×10^6 r. Further irradiation up to 1.0×10^8 r results in increased fermentability which reaches its maximum at this point resulting in the wood becoming hygroscopic and friable. A comparison is made of the irradiation effects in basswood with the effects in cellulose (filter paper) and lignin irradiated by the same process.

2997

X-RAY SENSITIVITY OF E. COLI AS MODIFIED BY OXYGEN TENSION. Alexander Hollaender, G. E. Stapleton, F. L. Martin. Nature 167, 103-4(1951) Jan. 20.

Radiosensitivity studies of bacterial cells of E. coli irradiated with x rays show the effect of oxygen tension on the bacterial suspension. The state of oxidation or reduction inside the organism during exposure to x radiation and the possible modifying effect of the types of metabolism carried out by the organism before irradiation are discussed.

RADIATION HAZARDS AND PROTECTION

2998

Argonne National Lab.
COMPLETE RADIOACTIVE EFFLUENT CONTROL FOR A RADIOCHEMICAL LABORATORY. Walton A. Rodger. Sept. 1951. Decl. Mar. 6, 1951. 22p. (AECD-3078)

The historical approach of bulk storage or disposal by dilution into watercourses is giving way to a program of waste volume reduction in which the effluvia released are at or near natural background. The types of wastes (gases, liquids, and solids) to be expected from the operation of an atomic research and development laboratory are discussed. The systems adopted for handling these wastes at Argonne National Laboratory are discussed in some detail. The equipment is described, and operating data and costs are given. A general flowsheet giving waste collection and processing procedures is included, and pictures of equipment are shown wherever possible. The processes discussed are gas filtration, incineration, evaporation, ion exchange, and drying. 7 figures. (auth)

2999

Brookhaven National Lab.
METEOROLOGICAL FACTORS IN ATMOSPHERIC POLLUTION PROBLEMS. (abstract) Maynard E. Smith. [nd.] 1p. (AECU-1213)

The report is reproduced here in its entirety.

The influence of meteorological parameters in the dispersion of cooling air from the Brookhaven nuclear reactor stack has been under investigation for three years. The empirical results obtained with an oil-fog test effluent are compared with theoretical expectations, and a method of resolving these differences is described. The nuclear reactor itself has been operating for the past six months, providing a new source of data on the dispersion of stack effluent. Unclassified aspects of the relationship between oil-fog and radiation data are presented insofar as they have been established at the present time. Brookhaven experience has shown that the meteorological factors of importance in certain pollution problems can be forecast with an accuracy comparable to that achieved in standard, public weather forecasts. The basic features of the forecast program are described briefly.

3000

Los Alamos Scientific Lab.
NEW TYPE FINGER FILM BADGE. Apr. 24, 1951. 3p. (AECU-1276; LADC-977)

A film badge in which the film and 20-mil-thick brass and Cd filters are inserted into a vinyl chloride snap-fastened finger strap is illustrated. The badge has been accepted within the Los Alamos laboratory as the least objectionable to wear for work involving considerable finger and hand exposure. It can be worn under rubber gloves, does not hamper finger manipulation, is waterproof and lightproof, and is not affected by most solvents.

3001

DRUGS WHICH MAY GIVE PROTECTION AGAINST ATOMIC RADIATION. J. F. Loutit. Mfg. Chemist 22, 49-51(1951) Feb.

A brief survey is made of present work toward finding means of protecting living tissue against ionizing radiation. Among the substances discussed as protective devices are the amino acids, thiourea, sodium ethane, dithiophosphonate, protamine sulfate, and toluidine blue. Results of several recent experiments are cited.

3002

ESTIMATING RADIOELEMENTS IN EXPOSED INDIVIDUALS—II. RADIATION DOSAGE AND PERMISSIBLE LEVELS. Jack Schubert. Nucleonics 8, 66-78(1951) Mar.

The practical side of judging the amounts and fates of radioactive substances that enter a worker's body involves consideration of arbitrary standards. These standards interrelate physiological data on "standard man" and the properties of the radioelements most harmful to him. 38 references. (auth)

3003

ON THE BRITISH RECOMMENDATIONS FOR PROTECTION IN ATOMIC BOMB ATTACKS. Rudolf Hanslian. Chem. Ztg. 74, 757-8(1950) Dec. 21. (In German)

A few critical remarks are made on the pamphlet, Atomic Warfare, published by the British Home Office in 1950 as No. 6 of Vol. 2 of the series Civil Defense, Manual of Basic Training. Although recognizing the great value of the pamphlet, the author questions several assertions made therein, such as the evaluation of the neutron danger, which has been superseded by information given during the conference on atomic energy in London, Oct. 22 and 23, 1950, and the low estimation of dangers from radioactive contamination, which contradicts Thirring's calculations (Acta Phys. Aust. 2, 379(1949); NSA 3-192).

3004

THE PHYSICIAN'S PROBLEM IN ATOMIC WARFARE. James P. Cooney. J. Am. Med. Assoc. 145, 634-7(1951) Mar. 3.

A brief discussion of hazards relating to atomic bomb bursts for the benefit of medical men called upon to assist with planning groups for civilian defense is presented. The following topics are covered: types of casualties, i.e., from blast, thermal burns, and radioactivity; ground burst, i.e., area and internal radiation; and underwater burst.

3005

SAFETY CONSIDERATIONS IN THE THERAPEUTIC USE OF RADIOACTIVE SUBSTANCES. George K. Schweitzer. J. Tenn. State Med. Assoc. 43, 164-6(1950) May.

It is indicated that comparatively little is known of the hazards of handling radioactive substances outside of government-sponsored laboratories. Health hazards, detection of health hazards, effects of radiation on the body, laboratory operation, and laboratory construction are discussed.

3006

WARFARE WITH RADIOACTIVE AGENTS. A MEDICAL APPRAISAL. PART I. GENERAL SURVEY. Finn Devik, Leiv Kreyberg, and Erik Poppe. In Forsvarets Forsknings-institutt, Årbok II, 1948-49, 442-68. (In Norwegian)

On the basis of published materials and in the light of existing experimental data on biological effects of ionizing radiations, an analysis is made of bodily damages wrought by atomic bombs in Japan.

RADIATION SICKNESS

3007

Naval Medical Research Inst., Bethesda
THE HEMORRHAGIC SYNDROME OF ACUTE IONIZING RADIATION ILLNESS PRODUCED IN GOATS AND SWINE BY EXPOSURE TO THE ATOMIC BOMB AT BIKINI, 1946; Appendix No. 15 to the Final Report. E. P. Cronkite. Oct. 7, 1948. 16p. (NP-1902)

The hemorrhagic manifestations of acute total-body-radiation illness in goats and swine exposed to the Test Able and Test Baker atomic bomb blasts have been described. In general, the hemorrhagic syndrome can be divided into three stages: (1) stage of increased capillary fragility, (2) increased capillary fragility plus a progressive thrombopenia, and (3) increased capillary fragility, thrombopenia, and a blood-coagulation defect. The blood-coagulation defect was observed only in fatally irradiated animals in which terminal bacterial invasion was also prominent. A circulating anticoagulant was shown to be present 10 to 12 days after exposure. It could be neutralized in vitro by toluidine blue and to a lesser extent by thrombin and thromboplastin, thus confirming the work of Allen and associates. Evidence was presented suggesting that fibrinolysins may have been activated or increased in concentration. (See also NSA 4-1340) (auth)

RADIOGRAPHY

3008

Naval School of Aviation Medicine, Pensacola
ELECTRONIC RADIOGRAPHY BY TRANSMISSION USING RADIOACTIVE MONOLAYERS. Dietrich E. Beischer. May 15, 1950. 8p. (NP-1993)

A method is described for electronic radiography by transmission in which the specimen is placed between and in intimate contact with a uniformly radiating source on one side and a photographic plate on the other. The radiating

source is in the form of mono- or multilayers of molecules tagged with radioactive isotopes. The picture of a thin specimen as taken in β light of C^{14} is shown.

RADIOTHERAPY

3009

THE USE OF RADIOACTIVE ISOTOPES IN OTOLARYNGOLOGY. Herbert Duncan. J. Tenn. State Med. Assoc. 44, 89-93(1951) Mar.

Developments in the use of radioisotopes from a crude form with no set unit of activity to the use of isotopes prepared as a sterile, pyrogen-free colloid are mentioned. Use of radioisotopes in the treatment of four hopeless cases of cancer at the Vanderbilt University Hospital is described.

TOXICOLOGY STUDIES

3010

Rochester Univ.
AN ANNOTATED BIBLIOGRAPHY OF THE LITERATURE ON THE PHARMACOLOGY AND TOXICOLOGY OF FLUORINE AND ITS COMPOUNDS. Frank A. Smith. Jan. 29, 1951. 155p. (UR-154)

The bibliography of 1393 items includes references from Chemical Abstracts 1936-50, Biological Abstracts 1936-1947, Quarterly Cumulative Index Medicus 1936-1948, and Nuclear Science Abstracts 1948-1950.

3011

THE ACTION OF LITHIUM ON AMPHIBIAN EMBRYOS. R. Lallier. Bull. soc. chim. biol. 32, No. 7-8, 451-7(1950). (In French)

The effect of various substrates (Na salts of lactic, pyruvic, acetic, glutamic, succinic, fumaric, and malic acids) on the development of Rana fusca is described. Retardation of development is the rule. The action of these substrates on embryos previously placed in LiCl solution has been studied. No modification of the hypomorphic state caused by the Li ion could be obtained by addition of the substrates. The lithiated embryos exhibited inhibition in respiration (20 to 35%). Pyruvate caused a 20 to 50% increase in oxygen consumption in the normal embryos but did not modify the Li-produced respiration inhibition. A hypothesis relating the direct action of the Li ion to cell metabolism is presented.

TRACER APPLICATIONS

3012

Brookhaven National Lab.
THE POSITION OF C^{14} IN SUNFLOWER LEAF METABOLITES AFTER EXPOSURE OF LEAVES TO SHORT PERIOD PHOTOSYNTHESIS AND DARKNESS IN AN ATMOSPHERE OF $C^{14}O_2$. Martin Gibbs. [nd.] 17p. (AECU-1114)

Detached sunflower leaves were allowed to photosynthesize in strong light for a short period in an atmosphere of $C^{14}O_2$, after which the carbohydrates (sucrose, glucose, fructose, dextrin, and starch), alanine, and malic acid were isolated, and the location of the C^{14} was determined. The same compounds were isolated and degraded from leaves which had been exposed to $C^{14}O_2$ in darkness. In the photosynthesis experiments (a) the monosaccharides contained no label, (b) dextrin approached uniform distribution of carbon most rapidly and starch most slowly, (c) the labeling of alanine was similar to that of sucrose, and (d) malic acid remained predominantly carboxyl labeled during all exposures. In dark experiments (a) the monosaccharides contained no label, (b) the carbohydrates were labeled only in carbon atoms 3 and 4, and (c) the alanine and malic acids were labeled only in the carboxyl carbon. The data indicate that before labeling can occur in positions other than carbon atoms 3 and 4 of sugar and the carboxyl carbon of amino acids and organic acids, light is necessary to initiate the cycle which synthesizes the C_3 acceptor. 10 references. (auth)

3013

Hanford Works
BIBLIOGRAPHY OF TRACER APPLICATIONS OF DEUTERIUM TO BIOCHEMICAL STUDIES. R. C. Thompson. Feb. 13, 1951. 41p. (HW-20283)

The coverage is limited primarily to tracer applications. The numerous papers dealing exclusively with the pharmacological effects of deuterium in high concentration have been excluded. A number of papers not primarily concerned with tracer applications have been included because of their obvious bearing on the subject, e.g., studies of the pharmacological effects of deuterium in low concentrations, studies of exchange reactions involving compounds of biochemical interest, studies on the normal deuterium content of biological materials, analytical methods, etc. A systematic search for references later than 1949 was not made, although numerous 1950 references are included.

3014

Columbia Univ.
THE MOUSE THYROID AND RADIOACTIVE IODINE (I^{131}); 1. GENERAL MORPHOLOGY OF THYROID GLAND. Roberts Rugh. Mar. 1, 1951. 11p. (NYO-1544)

The first in a series of papers dealing with the effect of carrier-free NaI^{131} on the adult nursing and nonnursing mouse and also on the litter young is presented. The emphasis is on the effect of lactation on the distribution of radioiodine and the consequent alteration of the expected histopathological effects. In this brief introductory paper a detailed morphological analysis is made of the thyroid gland itself, the data of which are important in explaining the histopathological effects on various parts of the gland. It is shown that in the adult the gland weighs approximately 4 mg and has an average (lobe) length of 1500 μ, lobe width of 600 μ, and lobe thickness of 900 μ. The isthmus measures an average of 1300 μ between the lobes, 400 μ from anterior to posterior, and 100 μ from front to back. There is radioautographic evidence that the gland is functional at birth. (auth)

3015

THE DIGESTION AND ABSORPTION OF P^{32} LABELED CASEIN BY THE YOUNG CALF. G. P. Lofgreen, Max Kleiber, and A. H. Smith. J. Nutrition 43, 401-11(1951) Mar. 10.

Studies are reported on the rate of absorption of P^{32} by calves fed labeled casein, and comparisons are made with similar calves fed or injected with the isotope in inorganic form. Tissue distribution of the P^{32} was determined 24 hr after feeding. The results show that the digestion of casein is initiated rather rapidly and is prolonged over the 24-hr period. When labeled inorganic phosphate is added to the milk, absorption takes place in much different pattern. Tissue distribution of the isotope indicated that it is probable that the calf absorbs inorganic phosphate even when it is fed in the organic form as phosphoprotein. Liver and kidney consistently showed rapid phosphate exchange rates, but brain-tissue rates were notably slow. The omasum, rumen, and jejunum appeared to have high phosphate exchange rates in comparison to other sections of the gastrointestinal tract. (auth)

3016

FORMATE FIXATION IN PYRUVATE BY ESCHERICHIA COLI. Harold J. Strecker. J. Biol. Chem. 189, 815-30 (1951) Apr.

The incorporation of formate carbon into pyruvate, as catalyzed by extracts of E. coli, has been shown to require inorganic phosphate, cocarboxylase, coenzyme A, and possibly manganese. Isotopic experiments with whole-cell suspensions of E. coli have indicated that net synthesis of pyruvate is not a valid criterion of the reversibility of the phosphoroclastic decomposition of pyruvate. A previous report that aging of extracts of E. coli causes preferential inhibition of pyruvate and breakdown as compared to formate fixation has been clarified and reinterpreted. Methyltartronic acid, a postulated intermediate for the formate fixation reaction, has been shown to be inactive in this system. The possible connection between the phosphoroclastic breakdown of pyruvate and the incorporation of carbon from formate into pyruvate has been discussed. (auth)

3017

INCORPORATION OF C^{14} FROM METHIONINE INTO FATTY ACIDS OF ESCHERICHIA COLI. C. H. Wang, Vernon H. Cheldelin, Tsoo E. King, and Bert E. Christensen. J. Biol. Chem. 188, 759-61(1951) Feb.

The synthesis of C^{14}-labeled methionine, measurement of radioactivity, growth of bacteria, hydrolysis with acids, and determination of methionine were all carried out as described previously (J. Biol. Chem. 188, 753-8(1951) Feb.). The administration of $C^{14}H_3$-labeled methionine to E. coli in the presence of 2-chloro-4-aminobenzoic acid resulted in an appreciable incorporation of radioactivity into the fatty acids as well as into the humin fraction of acid-hydrolyzed cells. (auth)

3018

METABOLISM OF C^{14}-LABELED GLYCINE, l-HISTIDINE, l-LEUCINE, AND l-LYSINE. Henry Borsook, Clara L. Deasy, A. J. Haagen-Smit, Geoffrey Keighley, and Peter H. Lowy. J. Biol. Chem. 187, 839-48(1950) Dec.

The synthesis of l-histidine-2-C^{14}-imidazole is described. C^{14}-labeled l-α-aminoadipic acid, glycine, l-histidine, l-leucine, and l-lysine were injected intravenously into mice. Within less than 10 min nearly all the amino acid had disappeared from the blood into the carcass. Within the next 30 min 18 to 47% of the injected amino acid (except α-aminoadipic acid) was incorporated into the visceral proteins; after an hour both the incorporation into the visceral proteins and the initial burst of oxidation of the amino acid had attained nearly their maxima. From 1 hr after the injection onward a significant amount of labeled amino acid appeared in the plasma proteins, and within 2 hr the visceral and plasma proteins were in balance with respect to labeled amino acid content. No α-aminoadipic acid was incorporated into either the visceral or serum proteins. It was oxidized at approximately the same rate as lysine. Similarly rapid rates of incorporation were found in the guinea pig and rabbit. Rates of incorporation are given of the labeled amino acids in vivo into the proteins of different fractions of guinea pig liver. 20 references. (auth)

3019

PARTICIPATION OF PHOSPHOLIPIDES IN LYMPHATIC TRANSPORT OF ABSORBED FATTY ACIDS. B. Bloom, I. L. Chaikoff, W. O. Reinhardt, and W. G. Dauben. J. Biol. Chem. 189, 261-7(1951) Mar.

The present study was undertaken to test the participation of lymph phospholipides as vehicles for the transport of an absorbed, long-chain fatty acid from the small intestine to plasma. Palmitic acid, the carboxyl carbon of which was labeled with C^{14}, was fed to rats in which cannulae had been introduced into the intestinal lymphatics or thoracic ducts. As much as 96% of the C^{14}-labeled fatty acids recovered in the lymph obtained from these two sources was present in forms other than phospholipides. The conclusion is drawn that phospholipides are not important transport forms for absorbed palmitic acid. The contribution of the small intestine to the synthesis of the plasma phospholipides during fat absorption is discussed. (auth)

3020

PURINE INCORPORATION INTO PENTOSE NUCLEOTIDES OF THE RAT. Denis H. Marrian, Virginia L. Spicer, M. Earl Balis, and George Bosworth Brown. J. Biol. Chem. 189, 533-41(1951) Apr.

The isolation of six ribonucleotides from the pentose nucleic acid fraction from rat tissue has been accomplished by a combination of the hydrolysis conditions of Schmidt and Thannhauser and the anion-exchange separation of Cohn. The investigation of the incorporation of C^{14}- and N^{15}-labeled adenine into these various nucleotides has indicated that the two isomeric adenylic acids, as well as the isomeric guanylic acids, are metabolically indistinguishable. The essentially equal incorporation of the N^{15} and C^{14} labels of the adenine into the polynucleotide guanine has furnished further evidence that the purine ring remains intact during this transformation. Carbon atom 8 of adenine is not oxidized to respiratory CO_2 to a significant extent. (auth)

3021

RADIOACTIVE CALCIUM IN THE STUDY OF ADDITIVE AND NATIVE SUPPLIES IN THE SOIL. Henry C. Harris, W. H. MacIntire, C. L. Comar, W. M. Shaw, S. H. Winterberg, and S. L. Hood. Science 113, 328-9(1951) Mar. 23.

An account is presented of experiments using Ca^{45}-labeled $CaCO_3$ in the determination of the relative contributions of native Ca and added Ca to leachate Ca from limed soils and to the plant Ca from crops grown thereon. Lysimeter and greenhouse experiments were conducted after incorporating the labeled liming materials in the soils at rates of 0, 1000, 2000, 3000, 4000, and 5000 lb/acre.

3022

RADIOACTIVE INDICATORS IN BIOLOGY AND THEIR MEDICAL APPLICATIONS. Francois Morel. Industrie natl., No. 2, 51-60(1950) Apr.-June. (In French)

A general discussion of some applications of tracers to biology and medicine and of the techniques used is presented. 5 figures. No references.

3023

THE RADIOIODINE-ACCUMULATING FUNCTION OF THE HUMAN THYROID GLAND AS A DIAGNOSTIC TEST IN CLINICAL MEDICINE. Transactions of the American Goiter Association, 1950, p.56-95. Springfield, Ill., Charles C. Thomas, Publisher, 1951. F. Raymond Keating, Jr., Samuel F. Haines, Marschelle H. Power, and Marvin M. D. Williams.

The I^{131}-accumulating function of the thyroid has been studied by tests of several types in 790 patients who had various conditions. It was found to be significantly increased in patients who had exophthalmic goiter, or adenomatous goiter with hyperthyroidism, and significantly reduced in patients who had myxedema. Significant elevation of radioiodine accumulation was also encountered in some patients who did not have hyperthyroidism. These included patients who had adenomatous goiter without hyperthyroidism, colloid goiter, hyperplastic thyroid nodules, and thyroid hyperplasia resulting from antithyroid drugs. Four methods for measuring radioiodine accumulation were compared. These included (1) the measurement of the quantity of radiodine excreted in the urine within 48 hr after its administration, (2) determination of extrarenal disposal rate from analysis of the curve of urinary radioiodine excretion, (3) in vivo measurement of the quantity of radioiodine accumulated in the thyroid 24 hr after administration of the dose, and (4) determination of an in vivo accumulation rate. All four values proved similar in diagnostic sensitivity. Measurement of radioiodine accumulation was considered to be comparable but not superior to determination of basal metabolic rate as a measure of thyroid function. In view of the difficulties and hazards which attend the use of radioiodine, it appears likely that it will supplement rather than supplant other diagnostic aids. 30 references. (auth)

3024

RELATIONSHIP OF $C^{14}O_2$ FIXATION TO CARBOHYDRATE METABOLISM IN RETINA. Robert K. Crane and Eric G. Ball. J. Biol. Chem. 189, 269-76(1951) Mar.

The effect of various inhibitors on the fixation of CO_2 into dicarboxylic acids by intact cattle retina under aerobic and anaerobic conditions in vitro has been studied. Aerobically 3,5-dinitro-o-cresol inhibits fixation by approximately 50%, suggesting the direct or indirect participation of energy-rich phosphate bonds in the process. This compound, as well as arsenate, inhibits anaerobic fixation to a smaller extent. Under anaerobic conditions, the presence of iodoacetate in concentrations just sufficient to block glycolytic processes causes a marked increase in the rate of CO_2 fixation. It is suggested that glucose-6-phosphate arising from glycogen is spared by iodoacetate for the production of reduced triphosphopyridine nucleotide, and that fixation of CO_2 occurs under such conditions through the malic enzyme system. (auth)

3025

SPECIFICITY OF RADIOIODINATED (I^{131}) IMMUNE GLOBULIN AS DETERMINED BY QUANTITATIVE PRECIPITIN REACTION. S. P. Masouredis, L. R. Melcher, and D. C. Koblick. J. Immunol. 66, 297-302(1951) Mar.

The reaction between human serum albumin and tracer-I^{131}-iodinated rabbit antibody was studied by the quantitative precipitin reaction. The amount of radioactivity found in each immune precipitate was proportional to the antibody nitrogen precipitated. Under the iodinating conditions described (1.3 iodine atoms per antibody molecule), no loss of immunologic specificity of rabbit antibody labeled with I^{131} was demonstrated. (auth)

3026

STUDIES OF THE METABOLISM OF TRYPTOPHAN LABELED WITH N^{15} IN THE INDOLE RING. Richard W. Schayer. J. Biol. Chem. 187, 777-86(1950) Dec.

Indole containing N^{15} has been synthesized. dl-Tryptophan containing N^{15} in the indole ring has been synthesized and resolved into the d and l isomers. Studies of the conversion of tryptophan to kynurenine, kynurenic acid, and xanthurenic acid in rats and rabbits are reported. Tryptophan is converted to kynurenine, kynurenic acid, and xanthurenic acid with only slight dilution. d-Tryptophan is utilized by the rat but not by the rabbit. Kynurenine is converted to xanthurenic acid in the rat without dilution and to kynurenic acid in the rabbit with significant dilution. There is no detectable conversion of the pyrrole ring of tryptophan to the tetrapyrrole structure of hemin in the rat. N^{15}-labeled indole fed to rats is mainly excreted in the urine. There is very little rupture of the ring and no detectable conversion to tryptophan. d-Tryptophan is readily converted to l-tryptophan, which is incorporated efficiently into the tissue proteins of rats. Both the d and l isomers showed significant rupture of the indole ring. Urinary ammonia had an isotope concentration four times as high as that of urinary urea, indicating that the kidney is probably the principal site of the ring-splitting reaction. Fecal excretion of isotope was small. Amino acids isolated from the internal organs of a rat fed a high isotope concentration of dl-tryptophan contained N^{15}, demonstrating that the ring nitrogen of tryptophan can enter the general nitrogen pool. 26 references. (auth)

3027

THE SYNTHESIS OF RADIOACTIVE CHOLESTEROL AND FATTY ACIDS IN VITRO. Roscoe O. Brady and Samuel Gurin. J. Biol. Chem. 189, 371-7(1951) Mar.

C^{14}-labeled acetoacetate is incorporated by rat liver slices into cholesterol without preliminary formation of 2-carbon fragments. Under in vitro conditions more acetate than acetoacetate is utilized for this biosynthesis. Labeled acetaldehyde is converted more readily by rat liver slices into cholesterol and long-chain fatty acids than is acetate. It has been confirmed that methyl C^{14}-acetate contributes slightly more labeled carbon for the synthesis of cholesterol than does carbonyl C^{14}-acetate under in vitro conditions. Carbonyl-labeled acetone is transformed by liver slices to acetate, long-chain fatty acids, and cholesterol. Evidence is presented suggesting that acetone is degraded by liver to a metabolically active 2-carbon fragment which is not acetate but which may be secondarily converted to acetate. Methyl C^{14}-isovalerate is utilized by liver slices for the biosynthesis of cholesterol. Possible mechanisms for this conversion are discussed. (auth)

CHEMISTRY

3028

Battelle Memorial Inst.
THE DISSOCIATION PRESSURES OF THORIUM DIHYDRIDE IN THE THORIUM-THORIUM DIHYDPIDE SYSTEM. Manley W. Mallett and Ivor E. Campbell. Jan. 31, 1951. Decl. Mar. 27, 1951. 15p. (AECD-3109; BMI-MWM-1)

Dissociation pressures have been measured in the Th–H system for the range of compositions up to approximately $ThH_{1.90}$ at temperatures from 650 to 875°C. The system resembles the Pd–H system in that the observed dissociation pressures are dependent on the solid-phase composition throughout the system. No gross hysteresis effects between absorption and desorption isotherms were observed, and the pressures could be reproduced upon repeated removal and addition of hydrogen.

3029

Oak Ridge National Lab.
THE THORIUM NITRATE–WATER SYSTEM ABOVE 20°. W. L. Marshall, J. S. Gill, and C. H. Secoy. [nd.] Decl. Apr. 10, 1951. 4p. (AECD-3135; CF-51-3-41)

Solubility data on the $Th(NO_3)_4$–H_2O system have been extended to 211°C to show a transition from the hexahydrate to a tetrahydrate at 111°C and a transition of the tetrahydrate to a lower hydrate at approximately 150°C. Decomposition of the system was indicated above approximately 115°C by the slight odor of HNO_3 and also by the partial vapor coloration above approximately 140°C. However, the rate of decomposition appeared sufficiently slow so as not to invalidate data obtained above these temperatures. The data presented are in good agreement with the solubility curve below 20°C determined by Misciatelli (Gazz. chim. ital. 60, 833(1930)).

3030

Ames Lab.
THE SPECTROPHOTOMETRIC DETERMINATION OF OVERLAPPING DISSOCIATION CONSTANTS OF DIBASIC ACIDS; CONTRIBUTION NO. 136. B. J. Thamer and A. F. Voigt. Jan. 3, 1951. 41p. (AECU-1127)

In this method buffered solutions of the acid are scanned at constant concentration of the dibasic acid and constant ionic strength, temperature, and cell length. The measured optical density is corrected for absorption by the solvent and buffer and plotted against pH at various wavelengths. A wavelength is selected at which the graph of optical density versus pH gives a decided maximum (or minimum) in the pH range in which the monobasic species predominate. The method is applied to the determination of the dissociation constants of isophthalic, terephtalic, and chloranilic acids. The similar use of other properties is suggested as a possible alternative to the use of optical density. 24 references.

3031

Argonne National Lab.
BOND TYPE AND STABILITY. (abstract) J. C. Hindman. Jan. 3, 1951. 4p. (AECU-1158; UAC-335)

A survey of present knowledge concerning bond type and stability is presented. Reference to a rule that "the greater the difference between the electronegativities of ions forming a complex the more ionic the bonds in the complex" is made in considering the effects of electronegativity. Complex formations in aqueous solutions are discussed. It is suggested that the constant of the dissociation reaction is the best quantitative measure of relative electronegativities of metal ions in aqueous solution.

3032

Argonne National Lab.
THE SYSTEM COBALTOUS CHLORIDE-WATER-ACETONE AT 25°C. (short and long abstracts) Leonard I. Katzin and John R. Ferraro. Jan. 12, 1951. 7p. (AECU-1178; UAC-337)

Results of the studies at 25°C are reported. Mole fractions of cobaltous chloride in acetone solutions as high as 11 mole % have been obtained, as compared with 7 mole % for the saturated aqueous solution. The existence over narrow ranges of water activity, of a tetrahydrate and a trihydrate of cobaltous chloride, is demonstrated. Other solid phases identified are hexahydrate, dihydrate, and monohydrate. Anhydrous cobaltous chloride imbibes acetone strongly. In the region of solutions containing two waters per cobaltous chloride, behavior was found attributable to the change in coordination number of the cobalt from 6 to 4.

3033

Argonne National Lab.
HEATS OF SOLUTION OF THE COBALTOUS NITRATE

HYDRATES IN CERTAIN ORGANIC SOLVENTS. Leonard I. Katzin and John R. Ferraro. Jan. 16, 1951. 6p. (AECU-1180; UAC-340)

In continuation of studies on the properties of solutions of inorganic salts in organic solvents, heats of solution have been measured for the hexahydrate, tetrahydrate, trihydrate, and dihydrate of cobaltous nitrate in a series of organic solvents, including alcohols, ethers, ketones, and esters, and in water. In accordance with similar measurements already reported for the uranyl nitrate hydrates, measurements with mixtures of acetone and isobutyl alcohol give evidence for a difference in the proportion of hexasolvate and tetrasolvate in the two solvents. Measurements with mixtures of acetone and water show that the heat of solvation with water is markedly greater than with the organic solvents. Energies of binding of water and of organic solvent groups are estimated. (auth)

3034

Illinois Univ.
DIFFUSION IN SOLID SULFUR. R. B. Cuddeback and H. G. Drickamer. [nd.] 6p. (AECU-1228)

Diffusion coefficients have been measured in single crystals of solid orthorhombic sulfur. The diffusion coefficient increases rapidly near the rhombic-monoclinic transition point indicating considerable disintegration of the lattice well below the transition temperature. A maximum in the diffusion coefficient at the transition temperature is explained in terms of the rate of transition to monoclinic sulfur. (auth)

3035

Carbide and Carbon Chemicals Div., UCC, K-25
A SUPPLEMENTARY BIBLIOGRAPHY TO METAL CARBONYLS. Thomas B. Hoover. Feb. 15, 1951. 78p. (K-716)

This bibliography is a supplement to a previous bibliography on metal carbonyls (K-365) and contains approximately 275 additional titles and abstracts. Subject and reference indexes are included. (See also NSA 2-1760)

3036

THE CONDUCTIVITY MEASUREMENTS OF THE AQUEOUS SOLUTIONS FROM THE SULFATES OF BIVALENT METAL AND TITANIUM. S. R. Patel. J. Am. Chem. Soc. 73, 488-9(1951) Jan. (Note)

The compounds $RSO_4 \cdot Ti(SO_4)_2$ were hydrolyzed by boiling with distilled water according to the expression $RSO_4 \cdot Ti(SO_4)_2 + 4H_2O \rightarrow Ti(OH)_4 + RSO_4 + 2H_2SO_4$. The electrical conductivity of the solutions so obtained has been measured and compared with that of similar solutions containing the calculated quantity of the bivalent metallic sulfate and H_2SO_4. The general procedure and the data obtained for the compound $ZnSO_4 \cdot Ti(SO_4)_2$ taken for illustration are given.

3037

Atomic Energy Research Establishment
ELECTROCHEMISTRY OF RADIUM, THORIUM, URANIUM, AND THE TRANSURANIUM ELEMENTS (Including Electrochemical Analysis), BIBLIOGRAPHY OF UNCLASSIFIED AND DECLASSIFIED REPORTS. Feb. 1951. 6p. (AERE-Inf/Bib-69)

A bibliography is given of reports on the above subject received as of December 1950.

3038

NEPA Div.
THE PREPARATION OF BERYLLIUM CARBIDE WITH HIGH VACUUM TECHNIQUE. J. G. Henry and W. E. Browning, Jr. Feb. 26, 1951. 3p. (NEPA-1746)

Milligram quantities of beryllium carbide were prepared by a technique based on pelletizing 2:1 Be and C, evacuating and degassing, and heating to 1000°C for 20 min. The method is recommended for preparation of C^{14}-labeled Be_2C for use in tracer studies.

3039

Naval Research Lab.
THE REACTION BETWEEN TERTIARY AMINES AND ORGANIC ACIDS IN NONPOLAR SOLVENTS. Samuel Kaufman and C. R. Singleterry. Oct. 9, 1950. 24p. (NRL-3743)

Cryoscopic measurements in dilute benzene solution indicate that aliphatic tertiary amines of high molecular weight react with fatty acids to form products in which two equivalents of acid are combined with one of amine, and that these products are in equilibrium with free acid and free amine to a significant extent. These amine acid complexes enter into secondary equilibria with additional acid to form less-stable complexes wherein four equivalents of acid are combined with one of amine. The data agree quantitatively with the assigned equilibrium constants. Only one equivalent of picric acid combines with one of amine to form a stable salt; this salt associates to form dimers but, like the alkylammonium halides, does not dissociate appreciably in nonpolar solvents. In dilute benzene solutions less-basic tertiary amines such as pyridine show only a slight tendency to react, whereas dimethylaniline, the least-basic amine studied, shows no detectable evidence of reaction with fatty acids. Tertiary aliphatic amines will effectively neutralize strong acids, but they will only reduce to a controlled and low level the concentration of a carboxylic acid in a nonpolar solvent. The results of this investigation are directly applicable to the theory and practice of corrosion inhibition in oils, fuels, and other nonaqueous systems. (auth)

3040

THE USE OF DIFFERENTIAL THERMOCOUPLES FOR KINETIC DETERMINATIONS; trans. from Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk 3, 349-58(1948). Yu. B. Kagan and A. N. Bashkirov; tr. by E. Hope. 1948. 13p. (NP-2264)

The oxidation of a Cu catalyst was studied by the differential thermocouple method. When this method is used to study the reactions taking place on a catalyst, and when the carrier is kieselguhr, the coefficient relating the reaction speed to the galvanometer deflection may, under specified conditions, be taken as a constant independent of the tem-

perature (with temperatures differing as much as 170°C). Using this differential thermocouple method under these conditions, it is shown possible to determine with adequate precision the value of the energy of activation of the reaction. The differential thermocouple method has been extended to the study of the kinetics of oxidation and reduction of metallic catalysts.

ANALYTICAL PROCEDURES

3041

Argonne National Lab.
NOTE: STUDIES ON THE CARRIER DISTILLATION METHOD AS AN ANALYTICAL AND AS A PURIFICATION TECHNIQUE. (Based on CK-801). Wayne W. Marshall and Mark Fred. [nd.] Decl. Mar. 20, 1951. 5p. (AECD-3039; ANL-HDY-578)

The carrier-distillation method is a means of analyzing U_3O_8 for comparatively volatile impurities by addition of 2% Ga_2O_3 to serve as a carrier, leaving the refractory material behind. An investigation of the method has been carried out to determine the efficiency of removal of the impurities, and to establish whether such a process might be used for purification of U_3O_8. Substantial purification is effected only for quite volatile elements, such as arsenic and to a lesser extent boron.

3042

Metallurgical Lab., Univ. of Chicago
DETERMINATION OF SMALL AMOUNTS OF CHLORINE WITH ORTHOTOLIDINE. J. I. Watters, E. F. Orlemann, R. A. Casler, and L. E. West. [nd.] Decl. Mar. 15, 1951. 19p. (AECD-3085; ANL-HDY-508)

Two methods for the determination of less than 1 μg of Cl_2 by using orthotolidine as a color reagent are described in this paper. The microdiffusion method developed by Watters (Report CK-1064) and tested by Casler and West (Report CK-1970) was finally chosen because it was both simpler and more reliable. The second method in which Cl_2 was swept from the sample in a stream of N_2 was developed by Watters and Orlemann (Report CK-2254). Modifications of this cell were found useful for separating microgram amounts of other halogens. Although both colorimetric and spectrophotometric methods were applied in the final determinations, the latter method was considerably superior and was finally adopted. (auth)

3043

Argonne National Lab.
THE COLORIMETRIC DETERMINATION OF POTASSIUM USING SILVER COBALTINITRITE. (Based on CK-1064, p.11-4 and CK-2254, p.33-6). W. H. Langham. [nd.] Decl. Mar. 16, 1951. 6p. (AECD-3087; ANL-HDY-568)

The method of Robinson and Putnam (Ind. Eng. Chem. Anal. Ed. 8, 211(1936)) has been adapted for the determination of amounts of K in the range 0.1 to 2 μg. Potassium is precipitated as K disilver cobaltinitrite, the precipitate is dissolved, and a color is developed in the solution by the addition of α-naphthylamine–sulfanilic acid reagent and allowing a diazotization and coupling reaction to take place between the nitrite and reagent. (auth)

3044

Argonne National Lab.
DETERMINATION OF SMALL AMOUNTS OF IRON IN THE PRESENCE OF URANIUM. (Based on CC-342). E. C. Anderson, Q. V. Larson, and W. H. Johnston. [nd.] Decl. Mar. 16, 1951. 7p. (AECD-3088; ANL-HDY-550)

A method is described for the colorimetric determination of Fe with α,α′-dipyridyl in an acetate-buffered solution prepared from the filtrate after a prior separation of U as the tetraoxide. (auth)

3045

Argonne National Lab.
THE DETERMINATION OF FLUORINE. (Based on CK-1326, CK-1756, CK-2254, CK-1664 CK-1970, CC-934). R. W. Spence, R. P. Straetz, D. P. Krause, W. M. Byerly, L. W. Safranski, L. E. West, and J. I. Watters; D. E. Wallace, comp. [nd.] Decl. Mar. 16, 1951. 27p. (AECD-3089; ANL-HDY-513)

Fluorine has been determined in this laboratory in micro quantities by several different methods. Four papers describing these methods are included in this report: the fluorimetric method using Al–morin reagent; a separation of fluorine in the form of HF; the volumetric method using a $Th(NO_3)_4$ titration; and a potentiometric method for titration.

3046

Argonne National Lab.
NEPHELOMETRIC DETERMINATION OF SULFATE. (Based on CK-2136, p.3-5) L. E. West, W. Davin, and J. I. Watters. [nd.] Decl. Mar. 19, 1951. 7p. (AECD-3090; ANL-HDY-547)

A procedure for the nephelometric determination of 4 to 5 μg of sulfur as sulfate with a precision and accuracy of ±15% is described. (auth)

3047

Argonne National Lab.
THE COLORIMETRIC DETERMINATIONS OF ZIRCONIUM WITH ALIZARIN. D. H. Templeton. [nd.] Decl. Mar. 19, 1951. 4p. (AECD-3091; ANL-HDY-548)

The use of alizarin (1,2-dihydroxyanthraquinone) as a colorimetric reagent for the determination of Zr has been extensively investigated by Liebhafsky and Winslow (J. Am. Chem. Soc. 60, 1776(1938)). Their method has been used successfully in this laboratory and has been found to be rapid and accurate. The most useful range of this method is 25 to 125 μg of Zr. Its lower limit is about 3 μg, or 3 ppm in 1-ml samples.

3048

Argonne National Lab.
THE DETERMINATION OF SULFUR USING A LEAD SUL-

FIDE STAIN. (Based on CK-1970, p.8-13; CK-2254, p.49-51.) H. E. Dyas, M. Goldsmith, and C. R. Schwob. [nd.] Decl. Mar. 21, 1951. 8p. (AECD-3094; ANL-HDY-586)

A modification of the method of Scherer and Sweet (Ind. Eng. Chem. Anal. Ed. 4, 103(1932)) for the determination of sulfide in the range 0.2 to 0.7 μg of S with a precision and accuracy of ±20% is described. S is evolved as H_2S, and the amount of S is estimated from the length of the PbS stain produced on a thread impregnated with starch and Pb acetate. (auth)

3049

Argonne National Lab.
NOTES ON THE COLORIMETRIC DETERMINATION OF IRON USING 1,10-PHENANTHROLINE. R. W. Bane and D. E. Waters. [nd.] Decl. Mar. 19, 1951. 4p. (AECD-3096; ANL-HDY-572)

The recommended procedure is as follows: The solution to be tested is diluted to a known volume. HCl can be added to prevent precipitation of $BiPO_4$. An aliquot is transferred to a 25-ml volumetric flask, 1 ml of 10% hydroxylamine hydrochloride reagent is added, and the flask is heated in boiling water for 10 min. After cooling to room temperature, 1 ml of 0.1% 1,10-phenanthroline and 1 ml of 10% ammonium citrate solution are added. The pH is adjusted to 4 to 6 with NH_4OH using hydrion paper as indicator; the solution is diluted to volume, and the transmittance is measured at 505 mμ.

3050

Metallurgical Lab., Univ. of Chicago
THE DETERMINATION OF ZIRCONIUM. (Based on CN-2235, p.20-30.) A. F. Stehney and L. W. Safranski. [nd.] Decl. Mar. 19, 1951. 16p. (AECD-3097)

The method of Hayes and Jones (Ind. Eng. Chem. Anal. Ed. 13, 603(1941)), which uses p-dimethylaminoazophenylarsonic acid to precipitate Zr, was studied for the range 1 to 7 μg of Zr. The most strongly interfering ions, namely phosphate, fluoride, sulfate, and the tetravalent cations of U, Th, and Pu, were studied. Two procedures are suggested. (auth)

3051

Metallurgical Lab., Univ. of Chicago
COLORIMETRIC DETERMINATION OF MOLYBDENUM IN URANIUM METAL. (Based on CC-388, p.6.) R. W. Bane. [nd.] Decl. Mar. 19, 1951. 9p. (AECD-3098; ANL-HDY-552)

The molybdenum thiocyanate extraction method has been adopted for the determination of Mo in U metal. Precision and accuracy are estimated at 5% in the range 5 to 25 μg. A prior separation of the bulk of the U is made with H_2O_2. (auth)

3052

Argonne National Lab.
QUALITATIVE SPECTROGRAPHIC ANALYSIS. L. W. Niedrack and E. H. Leslie. [nd.] Decl. Mar. 21, 1951. 13p. AECD-3099; ANL-HDY-589)

A general review is presented of the advantages, principles, precision and accuracy, interferences, apparatus, and procedure of spectrographic qualitative analysis.

3053

Argonne National Lab.
THE SPECTROGRAPHIC ASSAY OF HEAVY WATER. (Based on CC-2467.) Frank S. Tomkins and Mark Fred. [nd.] Decl. Mar. 21, 1951. 7p. (AECD-3100; ANL-HDY-577)

A spectrographic method of heavy-water analysis covering the range 1 to 99% deuterium was investigated as a supplement to the mass-spectrometric method. This method, based on the measurement of the relative intensities of the atomic lines H_α and D_α in spectra obtained by means of a high-frequency electrodeless discharge at low pressure, was tried and found to give good results in the range indicated. The spectrographic method has the advantage that the determination is made directly on the water sample. (auth)

3054

Argonne National Lab.
PURIFICATION AND TESTING OF GALLIUM OXIDE FOR SPECTROGRAPHIC USE. (Based on CC-1831.) Irving S. Bubes. [nd.] Decl. Mar. 21, 1951. 9p. (AECD-3101; ANL-HDY-584)

The carrier-distillation method of spectrographic analysis requires the use of a pure carrier, and GA_2O_3 is commonly used as such. The ether extraction of HCl solution of Ga based on the paper of Hoffman (J. Research Natl. Bur. Standards 13, 665(1934)) is a convenient and successful method for reducing impurity content. By this method Be, B, Si, Mg, Mn, Pb, Sn, Cu, Al, Ca, and Na may be reduced in Ga_2O_3.

3055

Argonne National Lab.
DETERMINATION OF TANTALUM, ZIRCONIUM, AND HAFNIUM IN COLUMBIUM BY THE POROUS GRAPHITE METHOD. (Based on CC-2694.) Helen S. Dunham and Mark Fred. [nd.] Decl. Mar. 20, 1951. 12p. (AECD-3102; ANL-HDY-582)

Densitometric procedure, a method for concentration of Ta in Nb, detailed steps, and results of analyses of stock samples are presented.

3056

Argonne National Lab.
SPECTROCHEMICAL ANALYSIS OF COLUMBIUM AND ZIRCONIUM. (Based on CC-1105.) Norman H. Nachtrieb and Wm. J. Tobin. [nd.] Decl. Mar. 20, 1951. 10p. (AECD-3103; ANL-HDY-579)

A method is presented for the spectrochemical determination of Zr and Cb. The samples are dissolved in molten potassium acid sulfate, and electrodes are prepared by dipping in the molten salt. Adequate Zr and Cb sensitivity

has been obtained by exciting the coated electrodes in a high-voltage spark discharge.

3057

Argonne National Lab.
THE PREPARATION OF HIGH-PURITY BERYLLIUM OXIDE FOR SPECTROGRAPHIC STANDARDS. (Based on CC-3524) F. S. Tomkins, G. W. Cressman, and L. J. Tolmach. [nd.] Decl. Mar. 20, 1951. 6p. (AECD-3104; ANL-HDY-575.)

A method for the preparation of beryllium oxide of high purity is presented. Be basic acetate, $BeO \cdot 3Be(C_2H_3O_2)_2$, is prepared from the metal or a convenient salt, a chloroform solution of this material is extracted with redistilled water, the dried basic acetate is distilled in a quartz apparatus, and this purified material is converted to the oxide by fuming down with sulfuric acid and igniting at 1000°C. Impurities detectable spectrographically were reduced to a very low level. (auth)

3058

Argonne National Lab.
MICROESTIMATION OF VANADIUM IN URANIUM. (Based on CC-660, p.7-10) G. A. Cowan. [nd.] Decl. Mar. 22, 1951. 12p. (AECD-3112; ANL-HDY-556)

A method for separating micro amounts of V from U has been developed. The V is estimated by the spectrophotometric measurement of phosphotungstovanadic acid, and 35 μg of V shows 80% transmittance in 25 ml of solution. As little as 7 ppm of V may be estimated to within 10% accuracy by taking a 5-g sample. (auth)

3059

Argonne National Lab.
THE DIPHENYLCARBAZIDE METHOD FOR CHROMIUM. (Based on CN-2235, p.67-76) G. F. Fassett, J. P. Huselton, R. E. Kitson, and P. L. Kirk. [nd.] Decl. Mar. 22, 1951. 14p. (AECD-3114)

A spectrophotometric study of the diphenylcarbazide analytical method for Cr has been made. The range of the method, the optimum conditions for the color reaction and the oxidation step, and the effect of numerous diverse ions were among the items investigated. The method depends on the oxidation of the Cr to the hexavalent state, followed by reaction with s-diphenylcarbazide in dilute mineral acid solutions. By varying the absorption cell length and the final volume, 0.06 to 15 μg of Cr can be determined with an accuracy of 5%.

3060

Argonne National Lab.
POLAROGRAPHIC DETERMINATION OF LEAD IN BERYLLIUM. (Based on ANL-4005) R. W. Bane. 1946. Decl. Mar. 22, 1951. 8p. (AECD-3115; ANL-HDY-570)

A rapid polarographic method for the determination of Pb in Be metal is described. No prior chemical separation is made. In the range of 200 to 800 ppm the precision is 10% or greater. (auth)

3061

Argonne National Lab.
COLORIMETRIC DETERMINATION OF SMALL QUANTITIES OF URANIUM USING 8-HYDROXYQUINOLINE. (Based on CC-2134, p.3-4 and JIW-522) Byron Hubbard. [nd.] Decl. Mar. 22, 1951. 8p. (AECD-3116; ANL-HDY-558)

A colorimetric method for the determination of U in the range 10 to 110 μg is described. Interferences and their elimination are discussed. A convenient filtering apparatus for use with this analysis is also described. Fifty micrograms of U has been determined with an accuracy of ±15%. (auth)

3062

Argonne National Lab.
THE DETERMINATION OF TOTAL NITRIC ACID IN THE PRESENCE OF ALUMINUM SALTS. (Based on CN-2235, p.51-7) M. E. Jackson and L. W. Safranski. [nd.] Decl. Mar. 27, 1951. 9p. (AECD-3118; ANL-HDY-580)

By titrating potentiometrically in a methyl alcohol medium, total nitric acid may be determined on the drop scale (50 μl) without interference from the hydrolysis of Al salts. (auth)

3063

Argonne National Lab.
A SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF COBALT. (Based on CC-269 and CC-464) Herbert Potratz and Ercole Motta. [nd.] Decl. Mar. 26, 1951. 11p. (AECD-3120; ANL-HDY-567)

A rapid colorimetric method for the determination of Co in the presence of U based on the extraction of tetraphenylarsonium cobaltothiocyanate with chloroform is described. Analysis of controls containing 1 to 20 ppm of Co showed a recovery of approximately 95% of the Co. Slight modifications of the procedure permit the determination of widely varying amounts of Co in a large number of materials. (auth)

3064

Argonne National Lab.
MICRODETERMINATION OF SILICA AND PHOSPHORUS BY THE MOLYBDENUM BLUE METHOD. (Based on CK-1106, CK-1229, CK-1326, CK-1791, CK-1970, and CK-2254) W. H. Langham, P. B. Fisk, M. J. Rasmussen, P. L. Kirk, R. E. Kitson, H. Delaney, L. Tolmach, L. E. West, and J. I. Watters. [nd.] Decl. Mar. 26, 1951. 21p. (AECD-3121; ANL-HDY-511)

Very small amounts of phosphate and silica have been measured by the extraction of phosphomolybdic acid and silicomolybdic acid with butyl alcohol. After subsequent reduction with $SnCl_2$ to molybdenum blue, spectrophotometric determinations can be made very satisfactorily. (auth)

3065

Argonne National Lab.
A RAPID PROCEDURE FOR THE COLORIMETRIC DE-

TERMINATION OF URANIUM WITH FERROCYANIDE. (Based on CC-3396) David H. Templeton. [nd.] Decl. Mar. 26, 1951. 11p. (AECD-3123; ANL-HDY-559)

A simple and rapid procedure is described for the colorimetric determination of U with ferrocyanide in the absence of interfering substances. The method is useful for amounts of U between 0.2 and 1.0 mg in a final volume of 25 ml. (auth)

3066

Argonne National Lab.
COLORIMETRIC DETERMINATION OF NICKEL IN URANIUM METAL OR OXIDES. (Based on CC-298) R. I. Martens. [nd.] Decl. Mar. 26, 1951. 6p. (AECD-3125; ANL-HDY-563)

The colorimetric method of Murray and Ashley (Ind. Eng. Chem. Anal. Ed. 10, 1(1938)) for the determination of Ni has been adapted to the determination of the element in U materials. A prior separation of U as the tetraoxide is performed. (auth)

3067

Argonne National Lab.
PRELIMINARY REPORT ON THE DETERMINATION OF MILLIGRAM QUANTITIES OF BISMUTH. (Based on CC-934) E. C. Anderson. [nd.] Decl. Mar. 27, 1951. 4p. (AECD-3126; ANL-HDY-581)

It is possible to determine milligram quantities of Bi with an accuracy of 1% by precipitating the Bi as 8-hydroxyquinoline tetraiodobismuthate, $(C_9H_7ON)HBiI_4$. The I in the precipitate is converted to iodide and is titrated with KIO_3 by the Lang cyanide method. (auth)

3068

Argonne National Lab.
THE COLORIMETRIC DETERMINATION OF MANGANESE. (Based on CN-1791, p.12) M. J. Rasmussen, R. E. Kitson, and P. L. Kirk. [nd.] Decl. Mar. 29, 1951. 9p. (AECD-3129; ANL-HDY-571)

The periodate oxidation of Mn(II) to permanganate and the colorimetric determination of the latter by use of the spectrophotometer were adapted to the analysis of very small volumes of solution. Several possible interfering substances were investigated. The sensitivity of the test was increased 150 times by decreasing the volumes and increasing the length of the absorption cells. (auth)

3069

Argonne National Lab.
COLORIMETRIC DETERMINATION OF MANGANESE IN URANIUM. R. W. Bane. [nd.] Decl. Mar. 29, 1951. 6p. (AECD-3130; ANL-HDY-549)

The colorimetric method of Willard and Greathouse (J. Am. Chem. Soc. 39, 2366(1917)) for the determination of Mn based on the oxidation to permanganic acid by periodate has been adapted to the analysis of U materials. No preliminary separation of the Mn from the U is necessary. In the range 10 to 120 μg the accuracy is from 5 to 10%. (auth)

3070

Argonne National Lab.
A RAPID DETERMINATION OF BISMUTH. A. F. Stehney, G. B. O'Connor, and H. A. Potratz. [nd.] Decl. Mar. 30, 1951. 11p. (AECD-3131; ANL-HDY-587)

This method was developed as a rapid means for the determination of Bi. It also has been applied in studies of the solubility of $BiPO_4$. The prevention of the interference of certain ions is discussed. Bi in the presence of KI reacts with tetraphenylarsonium chloride in an acidic solution to form the orange-colored precipitate, tetraphenylarsonium tetraiodobismuthate. The precipitate is soluble in chloroform, and the Bi concentration can be measured spectrophotometrically. Amounts from 2 μg to over 1 mg may be determined with an accuracy of 95% or greater. (auth)

3071

Knolls Atomic Power Lab.
THE MICRODETECTION OF SULFUR. Leonard P. Pepkowitz and Edwin L. Shirley. [nd.] 5p. (AECU-1200)

A universal method applicable to S in any form, including sulfate, sulfide, or elemental S, is described. The procedure is based on the use of a reducing mixture ($HCl + HI + H_3PO_2$) which converts the sulfur in most materials directly to H_2S on gentle heating. This includes such substances as elemental S, $BaSO_4$, $PbSO_4$, and a number of organic materials. Some organic substances, notably thiophene, must be pyrolized before reduction. The evolved H_2S is absorbed in an acidic ammonium molybdate – KSCN solution. The molybdate is reduced and red molybdenum thiocyanate is formed. The procedure is sensitive to 0.5 μg of S. Neither acetylene nor SO_2 produces the red coloration, but the reducing mixture will if allowed to boil over into the receiver. As, Sb, Se, and Te do not interfere since they are not converted to volatile reducing compounds by the reducing mixture. Nitrate interferes and must be removed.

3072

Knolls Atomic Power Lab.
THE MICRODETECTION OF CARBON. Leonard P. Pepkowitz. [nd.] 4p. (AECU-1201)

A convenient and simplified modification of the Emich method (Emich and Schneider, "Microchemical Laboratory Manual," Wiley, 1932) has found wide application in this laboratory because of the diversity of materials that can be handled, either organic or inorganic, with the extreme sensitivity of the original procedure. The method depends on the combustion of the sample in an atmosphere of O_2, absorption of the CO_2 formed in $Ba(OH)_2$, and identification of the carbon by the formation of the characteristic $BaCo_3$ crystals. In actual use a few tenths of a microgram is easily detectable with a magnifying glass if sufficient time is allowed for the diffusion of the CO_2 to the $Ba(OH)_2$ meniscus.

3073

Rockefeller Inst. for Medical Research and Brookhaven National Lab.

REAGENTS FOR THE VAN SLYKE-FOLCH WET CARBON COMBUSTION. Donald D. Van Slyke, John Plazin, and James R. Weisiger. [nd.] 14p. (AECU-1203)

Stability of the reagents for the Van Slyke-Folch combustion and convenience in handling them are increased by adding the chromic acid as $K_2Cr_2O_7$ with the KIO_3 in the combustion tube rather than as predissolved CrO_3 in the $H_2SO_4-H_3PO_4$ medium. A higher ratio (10:1) of KIO_3 to $K_2Cr_2O_7$ has been found desirable for carbohydrates and related polyhydroxyl alcohols than for other types of organic substances. Some details of the analysis are discussed. (auth)

3074

Oak Ridge National Lab.
POLAROGRAPHIC DETERMINATION OF SULFATES. A. D. Horton and P. F. Thomason. Feb. 19, 1951. 13p. (ORNL-755)

Inorganic sulfates in the range 15 to 150 μg of total sulfates were determined indirectly by reducing to H_2S in a distillation apparatus by means of a 4:4:1 mixture of 47% HI, 13M HCl, and 30% $H(H_2PO_2)$, respectively. The H_2S from the still was collected in ammoniacal $CdCl_2$ solution, and the resulting CdS was filtered, washed with dilute ammonia water, and dissolved with 500 μl of 2M HCl. The resulting $CdCl_2$ solution was diluted to 4 ml with 1M KCl and analyzed polarographically. The sulfide concentration was calculated from the Cd wave and multiplied by 2.99 to convert to sulfate. (auth)

3075

Atomic Energy Research Establishment
THE ANALYSIS OF BIOLOGICAL SAMPLES FOR POLONIUM. J. Rundo. Dec. 1950. 12p. (AERE-HP/R-627)

A method has been developed for the estimation of very small amounts of Po (10^{-12} curie) in urine and other biological samples. The method involves the removal of organic material by wet oxidation and coprecipitation of the Po with Te; the Po is then separated from the Te and deposited on one side of a Ag foil for counting. The over-all recovery has been tested with "spiked" samples and is about 85%. The analytical procedure is given in detail in an appendix. (auth)

3076

DETERMINATION OF ZIRCONIUM WITH THE AID OF MANDELIC ACID. A. A. Astanina and E. A. Ostroumov. Zhur. Anal. Khim. 6, No. 1, 27-33(1951). (In Russian)

A survey of procedures proposed since 1886 for the separation and analytical determination of Zr (20 references, of which 3 are Russian) ends in showing the advantages of the use of mandelic acid for these purposes, as recently suggested by Kumins (Anal. Chem. 19, 376(1947)). A detailed study of this method is described, the conditions of formation of the precipitate of Zr mandelate having been worked out for the presence of various interfering elements (rare earths, Mo, and others), and both for large and small Zr contents. The determination of Zr can be made by direct weighing of the mandelate formed, the results having been found as satisfactory as those obtained by calcining the precipitate to ZrO_2. If the ZrO_2 content to be determined is less than 0.0010 g, the precipitate forms and settles notably slower than at higher concentrations.

3077

ELECTROLYTIC INVESTIGATIONS. IV. ELECTROLYTIC DETERMINATION OF SELENIUM AND TELLURIUM AND THE SEPARATION OF COPPER FROM SELENIUM AND TELLURIUM. George Norwitz. Anal. Chim. Acta 5, 109-14(1951) Feb.

Rapid electrolytic methods are proposed for the determination of Se and Te and for the separation of Cu from Se and Te. The determination is accomplished by depositing Cu_2Se and Cu_2Te from nitric solutions containing the Se and Te in the quadrivalent state. The separation of Cu is accomplished by electrolyzing the Cu from a HNO_3 solution after oxidation of the Se and Te to the sexivalent state with permanganate. (auth)

3078

FLAME-PHOTOMETRIC DETERMINATION OF LITHIUM. E. Wilberg. Z. anal. Chem. 131, 405-9(1950). (In German)

A photometric method of quantitative determination of certain cations by using the light of the acetylene flame and colored-glass filters, as described for K, Na, and Ca by Riehm (Z. anal. Chem. 128, 249(1948)), is extended to Li^+ solutions. An interference filter furnished by the Zeiss firm gave the best results, whereas the use of a red filter, prepared by the same company for Li determinations, required special corrections when small quantities of K were present; it was altogether unsuitable in the presence of larger quantities of that element.

3079

POLAROGRAPHIC BEHAVIOR OF ORGANIC COMPOUNDS. VIII. THE SYSTEM meso-α, α'-DIBROMOSUCCINIC ACID – FUMARIC ACID. Isadore Rosenthal and Philip J. Elving. J. Am. Chem. Soc. 73, 1880-1(1951) Apr. (Note)

Previous work on the α-halogenated acids has shown that the polarographic reduction of these compounds involves the fission of the carbon-halogen bond and the formation of the saturated acid. No attempt was made in these studies to identify the configuration of the olefin produced, which is of primary interest with regard to any mechanism proposed for the reduction. It was therefore thought to be of interest to study this phenomenon under suitable conditions, with a view to investigating the nature of the process and to see whether the isomers formed as reduction products were analogous to those formed chemically. The data obtained indicate that meso-α, α'-dibromosuccinic acid is reduced in a one-step two-electron process to fumaric acid. It is impossible on the basis of the present work to distinguish between a simultaneous one-electron attack on each of the carbon-halogen bonds and an unsymmetrical two-electron attack on one of the two carbon-halogen bonds with a subsequent rearrangement of the free electron pair and the displacement of the second bromine atom as a bromide ion. The chemical evidence seems to favor the latter alternative.

3080

QUALITATIVE ANALYSIS FOR IDENTIFICATION OF CERTAIN METALS IN TOXICOLOGICAL WORK. Carlo Romano. Boll. soc. ital. biol. sper. 26, 604-5(1950) Apr. (In Italian)

A qualitative analytical procedure for rapid separation (involving use of H_2S) and determination of 17 cations, including UO_2^{++}, is described, the identification being based on spot color reactions taking place on chromatographic paper.

3081

QUANTITATIVE DETERMINATION OF VANADIUM WITH DIANTIPYRYLPHENYLMETHANE. S. I. Gusev, R. G. Beĭles, and E. V. Sokolova. Zhur. Anal. Khim. 6, No. 1, 43-8(1951). (In Russian)

One of the authors has pointed out the possibilities of using pyrazolone derivatives (antipyrine, pyramidon) for analytical purposes, based on the formation of "ammonium-type" salts with acids, especially complex acids (Gusev. Zhur. Anal. Khim. 1, 2, 114(1946); 4, 3, 175(1949)). In studying the effect of higher molecular weights of bases employed in these reactions, it was observed that diantipyrylphenylmethane, easily obtained from antipyrine and benzaldehyde, forms insoluble compounds with V(V), Cr(IV), and BiI_4^-. In the case of V, the precipitate is a hexavanadate which can be used for quantitative determinations of V, either by calcining the precipitate to V_2O_5 which is then weighed, or by dissolving it in an excess of alkali and titrating that excess with HCl. The presence of NaCl, Na_2SO_4, or $NaNO_3$ is not detrimental to the accuracy of the method.

3082

STUDIES IN THE THEORY OF THE POLAROGRAPHIC DIFFUSION CURRENT. IV. DIFFUSION CURRENT CONSTANTS OF SOME IONS IN THE ABSENCE OF GELATIN. Louis Meites. J. Am. Chem. Soc. 73, 1581-3(1951) Apr.

Using capillaries producing 7- to 16-mg drops, the diffusion-current constants of four ions (Ag^+, Cd^{++}, ferricyanide, and iodate) in various media in the absence of gelatin were found to be independent of drop time between about 2 and 7 sec. It is concluded that the relationship between diffusion current and capillary characteristics expressed by the Ilkovič equation is an accurate representation of the phenomena occurring at the dropping electrode under these conditions. Explanations are suggested for the different forms of the I versus t curve thus far observed. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURES

3083

Radiation Lab., Univ. of California
THE CRYSTAL STRUCTURES OF CeB_4, ThB_4, AND UB_4. A. Zalkin and D. H. Templeton. Nov. 9, 1950. Decl. Mar. 13, 1951. 22p. (AECD-3080; UCRL-522)

The crystal structures of the isostructural compounds CeB_4, ThB_4, and UB_4 have been deduced from x-ray-diffraction patterns of powders of the three compounds and single crystals of ThB_4. The space group is D_{4h}^5 – P4/mbm. The metal atoms are situated in layers, each atom having five nearly equidistant neighbors in the layer. The boron atoms form a three-dimensional network, with most of them situated in the planes halfway between the metal layers. The environment of each boron is very similar to that in UB_2 or to that in ThB_6. The boron-boron distances range from 1.69 to 1.80 A in these crystals. (auth)

3084

Argonne National Lab.
IDENTIFICATION AND CRYSTAL STRUCTURE OF PROTACTINIUM METAL. W. H. Zachariasen. Feb. 9, 1951. Decl. Mar. 27, 1951. 9p. (AECD-3113; ANL-FWHZ-185)

The presence of Pa metal in a reduction of PaF_4 with Ba has been found by x-ray diffraction. PaO also was present. Pa metal is tetragonal body-centered with two atoms in a cell of dimensions $a_1 = 3.925 \pm 0.005$, $a_3 = 3.238 \pm 0.007$ A. The calculated density is $\rho = 15.37 \pm 0.03$. Each metal atom has ten next neighbors. Eight are at a distance of 3.212 A and two are at 3.238 A. The metallic radius of Pa for coordination number twelve is 1.63 A. The results on Th, Pa, and U show that there are no 5f electrons in these metals. PaO has the NaCl type of structure with $a = 4.961 \pm 0.003$ A. The calculated density of PaO is $\rho = 13.43$.

3085

Knolls Atomic Power Lab.
THE INTENSITY OF X-RAY REFLECTIONS FROM GRAPHITE. Joseph S. Lukesh. Jan. 9, 1951. 2p. (AECU-1174)

The report is reproduced here in its entirety.

Franklin (Nature 165, 71(1950)) has recently reported an anomaly in the ratio of observed versus calculated intensities from graphite single crystals. The discrepancy consists in an anomalously high observed inetnsity of 1010 with respect to $11\bar{2}0$. This disagreement has been noted before (Lukesh and Pauling, Address before the Crystallographic Society of America, Fourth Annual Spring Meeting, Ann Arbor, Michigan, April 7, 1949; abstract in Am. Mineral. 35, 125(1950)), where it was suggested that a different layer stacking would bring the calculated ratio into agreement with observation. Miss Franklin has shown by theoretical considerations that the enhancement of $10\bar{1}0$ is to be expected because of the lack of spherical symmetry of the carbon atom. The high probability of electrons being localized in the bond directions means that the scattering factor, which is calculated from a spherically symmetrical model, is not valid for carbon. The present writer, unaware of Miss Franklin's work, reached a similar conclusion and made intensity calculations based on an extremely crude model. The model chosen was a synthetic crystal consisting of 2 electrons at the normal graphite atomic positions and $2\frac{1}{3}$ halfway between. In the light of Miss Franklin's theoretical analysis, it is thought that the results of the calculations, although only an approximation, are of interest as confirmation of her findings. The relative intensities as reported by Hull (Phys. Rev. 10, 661 (1917)) and as calculated on the basis of the model are given as follows. It can be seen that agreement is excellent.

Observed Versus Calculated Intensities

Refl.	Obs. (Hull)	Calc.
$11\bar{2}0$	1.17	1.25
$10\bar{1}0$	1.00	1.00
$21\bar{3}0$	0.17	0.17
$20\bar{2}0$	absent	0.01

It is of further interest to note that Bragg (The Crystalline State, Vol. I, p.55, The MacMillan Company, New York, 1934) used similar reasoning in accounting for the appearance of the forbidden 222 reflection in diamond.

3086

Ames Lab.
THE STRUCTURE OF $TiBe_{12}$, CONTRIBUTION NO. 127. R. F. Raeuchle and R. E. Rundle. Feb. 17, 1951. 37p. (ISC-125)

$TiBe_{12}$ is hexagonal with $a_o = 29.44$, $c_o = 7.33$ A, Z = 48. There is a pseudocell, however, with $A_o = 4.23$, $C_o = 7.33$ A, Z = 1, one Ti per pseudounit at 0 0 0 or 0 0 ½, and it is the alternation between these two positions which leads to the larger cell. Idealized Be positions are reported for the pseudocell. The structure is disordered, and though the general reason for the disorder is apparent, the particular type of disorder observed has not been explained. The structure leads to an unusual set of absences which are illustrated.

DEUTERIUM AND DEUTERIUM COMPOUNDS

3087

Argonne National Lab.
THE SPECIFIC GRAVITY OF PURE D_2O. Roger J. Voskuyl. [nd.] Decl. Mar. 30, 1951. 21p. (AECD-3122; ANL-HDY-514)

After reviewing critically the determinations of the specific gravity of D_2O up to 1945, the author describes the electrolysis apparatus and pycnometric technique used by this laboratory to determine this value, which is given as $S_{25}^{25} = 1.107744 \pm 0.000010$. Separation factor of the electrolytic cell, use of a mass spectrometer as an absolute-accuracy instrument, and calculation of composition from specific gravity are considered.

3088

CONDENSED GAS CALORIMETRY. II. HEAT CAPACITY OF ORTHO-DEUTERIUM BETWEEN 13.1 AND 23.6°K, MELTING AND BOILING POINTS, HEATS OF FUSION AND VAPORIZATION. VAPOR PRESSURES OF LIQUID ORTHO-DEUTERIUM. Eugene C. Kerr, Elis B. Rifkin, Herrick L. Johnston, and John T. Clarke. J. Am. Chem. Soc. 73, 282-4 (1951) Jan.

The heat capacities of solid and liquid orthodeuterium (97.8%) were measured and tabulated for the temperature range 13.66 to 22.73°K. In addition, the temperature and the pressure at the triple point were determined as 18.63 ± 0.01°K and 12.75 ± 0.5 int. cm, respectively. Heats of fusion and of vaporization were found to be 47.07 ± 0.1 and 293.93 ± 0.5 cal/mole, respectively. Vapor pressures were measured for the liquid range and fitted accurately by the equation log P(mm) = 4.70099 − 56.7247/T + 0.02478T. The entropy value of the ideal gas at 23.59°K and 1-atm pressure totals 21.43 ± 0.09 units, with nuclear spin entropy included, which is in good agreement with the value of 21.35 ± 0.01 units, calculated from the spectra of deuterium. (auth)

3089

ELECTROKINETICS OF HYDROGEN EVOLUTION. II. DEUTERIUM OVERVOLTAGE ON MERCURY. B. Post and C. F. Hiskey. J. Am. Chem. Soc. 73, 161-4(1951) Jan.

Measurements of deuterium overvoltage on mercury cathodes at current densities from 10^{-6} to over 10^{-3} amp/cm² and at temperatures from 4 to 70°C are reported. These have been compared with previously reported measurements of hydrogen overvoltage made under similar conditions. From these data, electrolytic separation factors for hydrogen and deuterium have been computed which agree very well with experimental separation data. These overvoltage and separation data appear to preclude the possibility that the slow step of the hydrogen discharge process, at mercury cathodes, involves more than one ion or atom. (auth)

FLUORINE AND FLUORINE COMPOUNDS

3090

AROMATIC FLUORINE COMPOUNDS. III. THE FLUORO-MESITYLENES AND DERIVATIVES. G. C. Finger, F. H. Reed, E. W. Maynert, and A. M. Weiner. J. Am. Chem. Soc. 73, 149-51(1951) Jan.

Nitration of mesitylene and difluoromesitylene in anhydrous HF gave near quantitative yields of dinitromesitylene and 2,4-difluoro-6-nitromesitylene, respectively. Difluoro- and trifluoromesitylene were synthesized by the Schiemann reaction in record yields reported for this type of reaction. Various intermediates and derivatives are reported for the fluoromesitylenes. Among the products of exhaustive chlorination of trifluoromesitylene, 2,4,6-tris-(trichloromethyl)-1, 3,5-trifluorobenzene and 2,4,6-trichloro-1,3,5-trifluorobenzene were identified. (auth)

3091

Imperial Chemical Industries, Ltd., Widnes
CHLORINE TRIFLUORIDE. R. leG. Burnett and A. A. Banks. [nd.] 5p. (NP-1984)

Preparation of chlorine trifluoride by mixing chlorine and fluorine in equivalent amounts and passing the gases into a reactor maintained at 280°C; properties; reactions with metals, nonmetals, salts, and organic compounds.

LABORATORIES AND EQUIPMENT

3092

Los Alamos Scientific Lab.
THE DESIGN OF SPECIAL HOOD FOR MACHINE TOOLS. James M. Taub. Aug. 20, 1948. 21p. (AECD-3048; LAMS-770; LADC-573)

Hoods for covering lathes and milling machines in order to control toxic fumes and to prevent loss of turnings from valuable metal stock are described. Safety, efficiency, and convenience to the operator are considered.

3093

Brookhaven National Lab.
INEXPENSIVE DRYING CABINET. C. F. Stearns. [nd.] 2p. (AECU-1184)

A brief description of a drying cabinet consisting of five banks of five 15-watt, 110-volt bulbs mounted in an inexpensive stationery-type metal cabinet whose dimensions are 76 by 35 by 18 in. is given. Switch and fuse box have been mounted on the outside.

3094

Brookhaven National Lab.
REQUIREMENTS FOR HANDLING A GAMMA EMITTER IN THE 1 mc. – 1 c. RANGE. Louis G. Stang, Jr. [nd.] 24p. (AECU-1185)

Suggested materials and equipment needed for physical and chemical manipulation of a gamma emitter such as Co^{60} are listed.

3095

Carbide and Carbon Chemicals Div., UCC, K-25
COLD TRAP ANTI-ICING SHIELD. J. E. Skvarla and Ernest C. Evans. Jan. 19, 1951. 9p. (K-700)

A simple and inexpensive sheet-metal cover which eliminates formation of ice at the top of cold-trap vacuum flasks has been devised. Its use reduces coolant consumption, labor, and breakage of apparatus. (auth)

3096

Atomic Energy Research Establishment
THE APPLICATION OF THE HOLLOW CATHODE SOURCE TO SPECTROGRAPHIC ANALYSIS; PART I. APPARATUS. F. T. Birks. Dec. 1950. 18p. (AERE-C/R-601)

The construction and operation of a water-cooled hollow cathode for spectrochemical analyses and its attendant rare-gas-circulation system are described in detail. The cathode design enables rapid sample changes to be made so that the method may be applied to analyses on a routine basis. (auth)

3097

A METHOD FOR THE QUANTITATIVE ADMINISTRATION OF CARCINOGENS. Perihan Cambel and Francis E. Ray. Tracerlog, No. 32, 9-10(1951) Feb.

A description of a remote-pipetting device for administration of radioactive carcinogenic chemicals to small animals is presented. The carcinogen in the solvent is drawn quickly into the pipet from the bottle by the plunger. Unlike most automatic pipets no carcinogen comes in contact with the pump or connecting rubber tubing. The carcinogen can be administered easily in amounts of 0.1 ml per animal by one person manipulating a wheel screw and carefully watching the pipet. 14 references.

3098

RADIOACTIVE CARBON AND ITS HANDLING IN THE LABORATORY. H. Götte. Angew. Chem. 63, 89-96(1951) Feb. 21. (In German)

The uses of C^{11} and C^{14} in chemical laboratories, especially in organic-synthesis work, are outlined, and the principal methods and apparatus employed are described.

RADIATION CHEMISTRY

3099

ENRICHMENT OF ANTIMONY ACTIVITY THROUGH THE SZILARD-CHALMERS SEPARATION. Milton Kahn. J. Am. Chem. Soc. 73, 479-80(1951) Jan. (Note)

A solution of triphenylstibine in benzene was irradiated with thermal neutrons. Several portions of this solution were then extracted with various aqueous solutions. In each case a large fraction of the total antimony activity appeared in the aqueous phase associated with a small amount of inactive antimony. The results are summarized. Further experimental work is described in which it was determined that the same fraction of the total antimony activity appeared in an aqueous phase regardless of whether calculations were based on Sb^{122} activity or on Sb^{124} activity. It is suggested that this particular Szilard-Chalmers reactions is the same for both isotopes of antimony.

RADIATION EFFECTS

3100

Argonne National Lab.
RADIATION CHEMISTRY OF FERROUS SULFATE SOLUTIONS. Edwin J. Hart. Jan. 1951. 3p. (AECU-1146; UAC-344)

This note demonstrates that theoretical values less than 4.0 are possible for the yield ratio of $Fe^{+3}_{(O_2)}/Fe^{+3}_{vac}$, obtained by x-ray or γ-ray irradiations of dilute aqueous solutions of ferrous sulfate. The fraction of radicals formed in the experiments of former investigators is compared with those obtained in the present work using Co^{60} γ rays and tritium β rays.

3101

Argonne National Lab.
GAMMA RAY INDUCED REACTIONS OF FORMIC ACID AND A DETERMINATION OF THE RADICAL PAIR YIELD IN AQUEOUS SOLUTION. Edwin J. Hart. Jan. 1951. 4p. (AECU-1179; UAC-339)

The effect of oxygen on the gamma-ray oxidation of 0.01M formic acid solutions has been studied in the concentration range from 0.0002M to 0.0012M oxygen. The oxygen absorbed is quantitatively converted to hydrogen peroxide, and an equimolar amount of carbon dioxide is formed. The net reaction is $HCOOH + O_2 = H_2O_2 + CO_2$. The course of oxidation of formic acid by gamma rays in aqueous solutions containing hydrogen peroxide and oxygen is represented by a series of reactions. A graph of the rate of hydrogen production versus reciprocal of oxygen concentration is linear in the range of concentrations from 0.00017M to 0.0012M.

Preliminary results are reported on gamma-ray-induced reactions of air-free solutions of formic acid in the concentration range from 0.01M to 10M.

3102

Argonne National Lab.
THE RADICAL PAIR YIELD OF IONIZING RADIATION IN AQUEOUS SOLUTION OF FORMIC ACID. Edwin J. Hart. Mar. 26, 1951. 17p. (AECU-1250; UAC-372)

The mechanism of formic acid oxidation by Co^{60} γ rays and by β rays from tritium disintegration has been studied in aqueous solution. In aqueous solutions subjected to ionizing radiation, H and OH radicals are produced. It is found that the formic acid – O_2 reaction may be employed to measure the relative amounts of those radicals that recombine to form H_2 and H_2O_2 and of those capable of reacting with formic acid and O_2. Twenty-one and 30% of these radicals undergo this recombination in formic acid solutions irradiated by Co^{60} γ rays and tritium β rays, respectively. In aqueous solutions of formic acid subjected to β-ray irradiation from tritium, 29.8 ev are expended per measurable radical pair. (auth)

3103

SOME (n,γ) EFFECTS IN IODOBENZENE. P. F. D. Shaw. J. Chem. Soc., 443-50(1951) Feb.

Some of the factors affecting the reproducibility of extractions (by an aqueous reagent) of radioiodine, I^{128}, from neutron-irradiated iodobenzene have been studied. In the presence of iodine, extractions are easily reproducible, but without iodine the amount of extractable radioiodine is variable because of the variable formation of aliphatic radioiodine compounds which are probably produced by the "rupture" of benzene rings by the energetic recoiling radioiodine atoms. The low value (about 40%) for the efficiency of extraction of radioiodine from iodobenzene compared with that for other organic monohalides is probably caused by the formation of a stabilized "iodonium" radical, Ph_2I^-. The chief evidence for this is that phenyl radicals (produced by photolysis) in iodobenzene give compounds containing the Ph–I–Ph structure, and that the presence of nitric oxide during the neutron-irradiation of iodobenzene increases the efficiency of extraction; no similar effect could be observed in bromobenzene or ethyl iodide where it is assumed that no stabilized radicals are produced. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

3104

Iowa State Coll.
THE FORMAL POTENTIAL OF THE Ce(IV) – Ce(III) COUPLE IN PERCHLORIC ACID. Frederick R. Duke and Robert F. Bremer. Mar. 2, 1951. 2p. (AECU-1193; LR-3)

The observation of Smith and Goetz (Ind. Eng. Chem. Anal. Ed. 10, 191(1938)) that the potential of the Ce(IV) – Ce(III) couple rises sharply from 1.70 to 1.87 volts with acid concentration in from 1M to 8M $HClO_4$ solutions is explained as based on difference in degree of hydration of the two ions. The Ce(IV) effectively inactivates 10 more water molecules than does Ce(III). Variations in the Ce(IV) – Ce(III) potentials in HNO_3, H_2SO_4, and HCl presumably arise from a combination of this effect and complex formation.

3105

THE ASSOCIATION OF CEROUS ION WITH IODIDE, BROMIDE, AND FLUORIDE IONS. Stanley W. Mayer and S. David Schwartz. J. Am. Chem. Soc. 73, 222-4(1951) Jan.

The distribution of cerous ion between cation-exchange resin and solutions of sodium iodide, bromide, fluoride, and perchlorate has been measured. The constants for ion-pair formation between Ce^{+3} and the halides have been calculated. (auth)

SEPARATION PROCEDURES

3106

Radiation Lab., Univ. of California
CHEMICAL PROCEDURES USED IN BOMBARDMENT WORK AT BERKELEY. W. Wayne Meinke. [nd.] Decl. Mar. 15, 1951. 35p. (AECD-3084; UCRL-432(add.2))

Detailed procedures are outlined for the chemical separations of V, Mn, Co, Ni, Se, Br, Ru, Ag, Cd, In, Sn, Sb, I, Ac^{226}, Np, Pu, Am, Cu, and the heavy rare earths, Sm, Eu, Lu, Yb, Tm, Er, Ho, Dy, Tb, and Gd, from various targets. Elution curves for the column separation of the rare earths are given. Procedures also are presented for the separation of formaldehyde from higher aldehydes, determination of formaldehyde and acetaldehyde, and determination of ethylene glycol or other 1, 2 glycols.

3107

Metallurgical Lab., Univ. of Chicago
PREPARATION OF Be^7 WITHOUT INERT CARRIER. L. Jacobson and R. Overstreet. May 10, 1946. Decl. Mar. 14, 1951. 1p. (AECD-3086; CC-3572)

After bombardment with deuterons, Li metal was dissolved with dilute acid. From this solution Be^7 was precipitated as $Be(OH)_2$ on Fe carrier using NH_4OH. The contaminants remained in the filtrate. After repeated precipitations in the presence of appropriate holdback carriers, the Fe was extracted with isopropyl ether, leaving the pure Be^7 solution. (auth)

3108

Argonne National Lab.
SALICYLATE EXTRACTION OF THORIUM FROM THE RARE EARTHS. (Based on CC-2694, p.25; CC-2771, p.10) G. A. Cowan. [nd.] Decl. Mar. 16, 1951. 7p. (AECD-3108; ANL-HDY-564)

Thorium salicylate, precipitated from an ammonium acetate – acetic acid buffered solution, is easily extracted into ethyl acetate, and most of the rare earths are left in the aqueous phase. Washing of the ethyl acetate phase permits a quantitative separation of Th, contained in the ethyl acetate from the rare earths, contained in the aqueous phase.

3109

Iowa State Coll.
THE SEPARATION OF RARE EARTHS BY ION EXCHANGE; VI. CONDITIONS FOR EFFECTING SEPARATIONS WITH NALCITE HCR AND ONE-TENTH PER CENT CITRIC ACID-AMMONIUM CITRATE SOLUTIONS, CONTRIBUTION NO. 124. F. H. Spedding, E. I. Fulmer, J. E. Powell, T. A. Butler, and I. S. Yaffe. [nd.] 22p. (ISC-123)

Procedures are reported for the successful separation of the rare earths using a high-capacity resin, Nalcite HCR (Dowex 50), and 0.1% citrate solution. The high-capacity resin proved to be superior to a low-capacity resin, Amberlite IR-100, for the separation of the heavy rare earths. Gram quantities of Er, Ho, and Dy have been obtained in purities greater than 99%. The process proved to be equally efficient when stepped up 50-fold to a pilot-plant-scale separation of the more abundant rare earths. (auth)

3110

THE ACTIVITY COEFFICIENT OF THENOYLTRIFLUOROACETONE IN BENZENE SOLUTION. Edward L. King and William H. Reas. J. Am. Chem. Soc. 73, 1804-5(1951) Apr.

The activity coefficient of thenoyltrifluoroacetone (TTA) in benzene solution has been determined by a study of the distribution of thenoyltrifluoroacetone between benzene and aqueous solutions. This activity coefficient may be calculated by using the empirical equation $y_B = 1 - 0.24(TTA)_B^{0.48}$, which represents the experimental data quite well. The activity coefficients are required data in the interpretation of metal-ion-extraction studies in which this substance is used as the chelating agent. (auth)

SYNTHESES

3111

INVESTIGATION OF THE FORMS OF PHOSPHORUS IN NEUTRON-BOMBARDED PHOSPHATES: ROLE OF HYPOPHOSPHATE. J. G. A. Fiskell. Science 113, 244-6(1951) Mar. 2.

Using calcium hypophosphate as a carrier, the following neutron-bombarded phosphates have been found to possess activity in the silver hypophosphate precipitate at pH 0.15 in phosphoric acid: monocalcium phosphates, superphosphate, calcium pyrophosphates, and calcium hypophosphite. A procedure for the preparation of radioactive magnesium ammonium phosphate believed to contain all the P in the orthophosphate form is outlined. The preparation of inactive ammonium orthophosphite by the action of PCl_3 or distilled water is described. Methods of preparation of other materials synthesized and reagents used are included.

3112

THE METABOLIC ACTIVITY OF THE α-HYDROGEN ATOM OF LYSINE. I. Clark and D. Rittenberg. J. Biol. Chem. 189, 521-8(1951) Apr.

1-Lysine containing α-N^{15} and α-deuterium has been synthesized. Labilization of the α-deuterium atom of lysine in the intact animal is slight in comparison with that of leucine or glycine, indicating that lysine is not involved in the transaminase system. (auth)

TRACER APPLICATIONS

3113

Fordham Univ. and Brookhaven National Lab.
STUDIES OF THE MECHANISM OF THE WILLGERODT REACTION; I. THE OVER-ALL MECHANISM. Ellis V. Brown, Edward Gerwonka, and R. Christian Anderson. [nd.] 18p. (AECU-1087)

The over-all course of the Willgerodt reaction (J. prakt. Chem. (2) 80, 192(1909); Ber. 21, 534(1888)) on acetophenone has been reinvestigated using C^{14}. By employing the Hofmann degradation (reported in detail) in the study of the reaction products, phenylacetic acid and phenylacetamide, it is shown that no skeletal rearrangements occur. Data are also presented which indicate that thermal decarboxylation procedures may be the source of unreliable information concerning mechanism studies. 21 references.

3114

Brookhaven National Lab. and Harvard Univ.
THE FAWORSKII REARRANGEMENT OF α-HALOKETONES. Robert B. Loftfield. [nd.] 29p. (AECU-1142)

2-Chloro-1-cyclohexanone-12-C^{14} was reacted with sodium amylate. Degradation of the product showed equal amounts of radioactivity in the α and β positions. Degradation of ketone recovered from the reaction mixture showed no halogen migration from α to α′ carbons. The degradation scheme was checked by examination of compounds in which the location of radioactive carbon had been established by synthesis. The most reasonable intermediate remaining appeared to be a cyclopropanone derivative. Examination of a large number of rearrangements revealed this proposed mechanism to be consistent with the products observed in almost every case.

3115

THE KINETICS OF THE EXCHANGE OF SULFUR BETWEEN THIOSULFATE AND SULFITE. Donald P. Ames and John E. Willard. J. Am. Chem. Soc. 73, 164-72(1951) Jan. (See also NSA 4-2269)

The transfer of the outer sulfur atom of S^{35}-labeled thiosulfate ion, the synthesis of which is given, to sulfite ion occurs in the temperature range 60 to 100°C at a rate which is proportional to the first power of the sulfite concentration and also of the thiosulfate concentration. The rate and activation energy appear to be essentially independent of pH in the range pH 5 to 14. The second-order velocity constant is given by the relation $k = 2.3 \times 10^9 e^{-14,500/RT}$ liters/mole/sec. The evidence indicates that the equilibrium of thiosulfate with sulfur and sulfite is not a part of the mechanism of sulfur transfer. Other factors to be considered with regard to the mechanism of this reaction are discussed. A preliminary value of 15 kcal/mole for the activation energy of the exchange of sulfide ion with thiosulfate has been determined. Previous evidence indicating that the sulfur atoms of thiosulfate are not chemically equivalent has been confirmed and extended to show that exchange between them does not occur in 5 hr at 125°C nor when the thiosulfate is precipitated as triethylenediaminenickel thiosulfate and subsequently dissolved in HCl. A reproducible routine method of determining the relative

specific activity of S^{35} in barium sulfate precipitates is described. (auth)

3116

THE USE OF DOUBLE DILUTION FOR THE SIMULTANEOUS DETERMINATION OF YIELD AND ACTIVITY OF RADIOACTIVE COMPOUNDS. Rowland H. Mayor and Clair J. Collins. J. Am. Chem. Soc. 73, 471-2(1951) Jan. (Note)

A method is described by which, when isotope dilution methods are applied to the determination of the yield in chemical and biological processes of a radioactive compound, an aliquot of the reaction mixture is diluted with a known amount of the inactive product, and a sample of the diluted compound is isolated and assayed for radioactivity. Proportional relations are set up. Reference to a recent synthesis of chrysene-5,6-C^{14} wherein this method was used in the determination is made.

TRANSURANIC ELEMENTS AND COMPOUNDS

3117

INTRODUCTION; CHAPTER I and NEPTUNIUM AND PLUTONIUM; CHAPTER X. In ATOMNAYA ENERGIYA (ATOMIC ENERGY). Moscow, Leningrad, State Publisher of Technical-Theoretical Literature, 1946. E. V. Shpolskii; G. N. Kolshenko, ed. 1946. 5p. (NP-2254)

Information of common knowledge, mostly drawn from the Smyth report, on the production of Pu in reactors has been arranged for the general reader. The following statement, unsupported by any reference, is included: "the power of the second reactor, built near Clinton in the state of Tennessee, operated at 1800 kw. By 1 Feb. 1944 this reactor had yielded 190 mg (?) of plutonium, and by 1 March of the same year it had produced a few grams."

TRITIUM AND TRITIUM COMPOUNDS

3118

Los Alamos Scientific Lab.
THE RADIATION INDUCED REDUCTION OF CERIC ION IN TRITIUM OXIDE-WATER SOLUTIONS. (abstract) G. E. Challenger and G. K. Rollefson. [nd.] 4p. (AECU-1187; LADC-956)

Tritium-hydrogen mixtures of known composition were converted to water which was condensed into a spectrophotometer cell containing a known amount of $Ce(HSO_4)_4$ and enough H_2SO_4 to make the final solution 0.5M in acid. The reaction was followed by measuring the optical density as a function of time at λ = 4358 A. The gas analysis showed the net reaction to be $2Ce^{+4} + H_2O \rightarrow 2Ce^{+3} + 2H^+ + \frac{1}{2}O_2$, as would be expected. However, excess H_2 and O_2 were also found, indicating that appreciable side reactions of the primary water-decomposition products took place. The rate of Ce^{+4} reduction was strictly first order with respect to tritium concentration and fairly close to zero order with respect to the concentration of Ce^{+4}. No steady-state concentration of Ce^{+4} was observed since its concentration dropped to zero during the reaction. These results are obtained by considering radiation effects of tritium decay.

URANIUM AND URANIUM COMPOUNDS

3119

Argonne National Lab.
A NOTE ON THE USE OF COPPER AMMONIUM CHLORIDE TO DISSOLVE URANIUM METAL. (Based on CC-1047, p.6; CC-1448, p.7.) L. W. Safranski and R. E. Fryxell. [nd.] Decl. Mar. 21, 1951. 3p. (AECD-3105; ANL-HDY-555)

The authors present this paper not because of any quantitative results obtained, nor as a recommended method but because of the unusual nature of the reaction. Although U is unreactive in a $CuSO_4$ solution, it is possible to dissolve 2 g of the massive metal in 100 ml of a solution containing 212 g of $CuCl_2.2H_2O$ and 133 g of NH_4Cl per liter in about 10 min. The pH changes during dissolution falling from an initial pH 8 to approximately 0.1. Preliminary studies of the solubility of U oxide and carbide in the reagent indicate the order of increasing solubility is UC_2, U_3O_8, and UO_2. The theory that perhaps the severe pH drop when the metal goes into solution is responsible for the solubility of the oxide and carbide was tested. A buffered solution was prepared by dissolving 70 g of $Cu(C_2H_3O_2)_2.H_2O$ and 75 g of NH_4Cl in 800 ml of water. Then 42 ml of HCl was added, and the solution was filtered and diluted to 1 liter. When 1 g of U metal was dissolved in 100 ml, the pH fell from 3.2 to 2.6. The size of the sample and the length of contact evidently influenced the solubility. It is doubtful that analytical results obtained by either of the Cu solution techniques are any more valid or meaningful than those of the "HCl insoluble" procedure.

ENGINEERING

HEAT TRANSFER AND FLUID FLOW

3120

Columbia Univ.
HEAT TRANSFER BY NATURAL CONVECTION FROM HORIZONTAL CYLINDERS TO LIQUID METALS; FINAL REPORT FOR JULY 1, 1949, TO JUNE 30, 1950. Seymour C. Hyman and Charles F. Bonilla. June 30, 1950. 30p. (NYO-560)

Heat transfer by natural convection from a horizontal ½-in.-diam cylinder to liquids has been investigated. Nine liquids were employed, including the lead-bismuth eutectic and mercury. The Prandtl number of the liquids ranged from 0.018 to 300. It was found that fluid flow in natural convection could be either streamline or turbulent, according to conditions. An expression has been set up to represent all the data in the streamline flow range. An expression for the prediction of the incidence of turbulence is

included. Surface wetting was found to have no effect on natural convection heat transfer. A method for measuring an average surface temperature which does not interfere with heat or fluid flow is described.

3121

Oak Ridge National Lab.
FORCED CONVECTION HEAT TRANSFER IN THERMAL ENTRANCE REGIONS; Part I. H. F. Poppendiek. Mar. 20, 1951. 29p. (ORNL-913)

Part I of this report deals with an analytical study of forced convection heat transfer in the thermal entrance region of parallel plate and pipe duct systems, with uniform wall temperatures, containing liquid metals that are characterized by low Prandtl's moduli and turbulent velocity profiles. Local heat transfer and convective conductance expressions in terms of Reynolds' and Prandtl's moduli are developed. (auth)

3122

COMPRESSIBLE SUPERSONIC FLOW IN JETS UNDER THE KÁRMÁN-TSIEN PRESSURE-VOLUME RELATION. N. Coburn. J. Applied Phys. 22, 124-30(1951) Feb.

The two-dimensional supersonic irrotational flow of a gas in a jet is studied by use of the Kármán-Tsien pressure-volume law. In the case of jets with free stream lines as boundaries, it is shown that two functions possessing certain desired properties completely determine the Kármán-Tsien flow. Further, the phenomenon of the periodic recurrence of the free stream jet boundary is explained by a folding property of the map of the flow in the hodograph plane.

3123

DEPENDENCE OF THE HEAT TRANSMISSION IN PIPES ON THE DIRECTION OF THE HEAT FLOW AND ON THE FREE CONVECTION. I. T. Alad'ev, M. A. Mikheev, and O. S. Fedynskiĭ. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk, No. 1, 53-67(1951) Jan. (In Russian)

Heat-exchange experiments with water flowing in vertical and horizontal tubes showed that, whereas in laminar and transitional stages free convection affects considerably the heat transmission, in the evolved turbulent stage the effect is practically nonexistent. The heat exchange is much greater when the liquid in the pipe is heated than when it is cooled, the difference reaching 20% for the turbulent state. This shows that the character of the temperature field is different in the two cases. A single variable can describe these differences in the equation.

3124

HEAT EXCHANGE THROUGH LIQUID AND GAS FILMS. D. I. Boyarintsev. Zhur. Tekh. Fiz. 20, 1084-97(1950) Sept. (In Russian)

The study of heat exchange through liquid and gaseous films has followed two general directions of thought: the film was regarded either as an insulating layer or as related to a stratum of air in atmospheric heat exchange. In the latter case observations and theory were chiefly concerned with horizontal films. The author reports on experiments conducted since 1939 on heat exchange through spherical gas layers and surveys and evaluates the existing published material on films of other geometrical shapes (planes and cylinders, both horizontal and vertical).

3125

HYDROMECHANICAL MODEL OF A CRITICAL STATE IN THE HEAT TRANSMISSION IN A BOILING LIQUID, FOR THE CASE OF FREE CONVECTION. S. S. Kutateladze. Zhur. Tekh. Fiz. 20, 1389-92(1950) Nov. (In Russian)

The amount of heat transmitted to a boiling liquid through the container wall is affected by the formation of a vapor film along the wall, when a certain critical value of the external heat supply is reached. A hydromechanical model of this phenomenon, for the case of free convection, is proposed which gives the critical heat value except for a proportionality factor.

3126

LIQUID FLOW IN THIN LAYERS. PART II. P. A. Semenov. Zhur. Tekh. Fiz. 20, 980-90(1950) Aug. (In Russian)

A study has been made of the upward movement of a thin liquid layer carried along a vertical wall by fast vertical gas currents. As pointed out in part I (Zhur. Tekh. Fiz. 14, 427(1944)), observations show peculiar undulatory movements in the liquid film, unexplainable by a preliminary theory. A more exact theoretical description and analysis of experimental aspects of the phenomenon are given. Besides its bearing on the general problem of the stability of the laminar layer, the subject is connected with several questions concerning practical devices ("choking" of rectification columns, two-phase flow, etc.).

3127

MATHEMATICAL THEORY OF STEADY HEAT TRANSFER FROM A VERTICAL CIRCULAR BORE, WITH SUPERIMPOSED FORCED AND FREE LAMINAR CONVECTIONS. G. A. Ostroumov. Zhur. Tekh. Fiz. 20, 750-7(1950) June. (In Russian)

Several authors have mentioned the problem of the deformed forced Poiseuille movement in a vertical pipe, caused by heat flow through the pipe walls. This problem has been solved in the present paper for a circular vertical bore in an isotropic material, on the assumption that the velocity vector of liquid particles moving in the bore is parallel to the latter's axis. Such an assumption is justified by numerous observations on convection processes in the middle part of vertical tubes. The laminar convective movement is regarded as a superimposition of free and forced convections. It is found that the resultant current has a strictly axial symmetry. Through the presence of a horizontal temperature gradient an additional convection appears which is antisymmetric with respect to an axial section. A formula gives the total heat transferred by the convections in the upward direction.

3128

ON CHARACTERISTICS OF HEAT EXCHANGE IN HIGHLY VISCOUS LIQUIDS. S. A. Rapoport. Zhur. Tekh. Fiz. 20, 1121-30(1950) Sept. (In Russian)

Using sugar-molasses solutions, the author has studied experimentally the little-known phenomena of heat exchanges in very viscous liquids. Among characteristic features observed was a distortion of the laminar movement by convection currents due to a marked viscosity gradient in the cross section of the pipe. Heat-exchange coefficients were obtained which are 50 to 100% higher than those used in industry, thus revealing a waste of efficiency reserves owing to inadequately devised equipment.

3129

ON PRE-STATIONARY STATES OF FREE HEAT CONVECTION IN CIRCULAR BORES. I. EXPERIMENTAL PART. G. A. Ostroumov. Zhur. Tekh. Fiz. 20, 991-1000 (1950) Aug. (In Russian)

In former papers (the latest: Zhur. Tekh. Fiz. 20, 750(1950)) a theory was developed which explained several aspects of heat convection currents that are observed in liquids flowing in vertical bores or tubes heated from below. It was concluded, as a main result, that the establishment of a definite vertical gradient of temperature (averaged on the pipe's transverse section) takes place, independent, within wide limits, of the quantity of heat transferred by the laminar current. However, with increasing heat quantity, a critical situation arises when the laminarity disappears, and in the postcritical states the thermal behavior of the liquid mass does not differ essentially from that of a solid body. This theory has been developed from the assumption, sustained by several facts, that the velocities of the liquid's particles are strictly vertical. An experimental study is described of modifications brought about in these results by the presence of horizontal components, very small compared with the vertical components, in the particles' velocities. Although the principal results of the theory remain applicable when the heating becomes intense, certain new phenomena are observed, such as a logarithmic law concerning the time needed for the convection to reach a given level and the peculiar damped temperature oscillations in the tube.

3130

ON PRE-STATIONARY STATES OF FREE HEAT CONVECTION IN CIRCULAR BORES. II. THEORETICAL PART. G. A. Ostroumov. Zhur. Tekh. Fiz. 20, 1311-14 (1950) Nov. (In Russian)

A theory on the establishment of the steady state of laminar heat convection in pipes and bores of circular cross section, the experiments on which were given in Zhur. Tekh. Fiz. 20, 750, 991(1950), is developed.

3131

ON UNSTEADY HEAT CONDUCTION IN SOLIDS OF ARBITRARY SHAPE. A. I. Veĭnik. Zhur. Tekh. Fiz. 20, 1383-8(1950) Nov. (In Russian)

In a recent paper (Zhur. Tekh. Fiz. 20, 295(1950)) a method was given for the approximate solution of problems of unsteady heat conduction in bodies of arbitrary shape. The method is based on certain properties of fields and, specifically, on that property which can be defined as the stability of the heat flow. The effect of the shape can be described by a certain variable parameter reflecting a special criterion of approximate similitude. This permits a wider use of the concept of similitude of temperature fields, since the latter no longer requires, as a necessary condition, the rigorous geometric similitude of the conducting bodies. It is shown how, by a further development of the theory of approximate similitude, a number of practical problems of unsteady heat conduction can be solved approximately. (auth)

3132

SOLUTION OF CERTAIN PROBLEMS OF HEAT TRANSMISSION BY METHODS OF ELECTRIC MODELS. S. S. Vyalov and L. G. Kogan. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk, No. 1, 39-52(1951) Jan. (In Russian)

Methods of reproduction of relationships between physical magnitudes in various phenomena by electric analogues, as developed by Gutenmakher (Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk, Nos. 4, 5 (1945)), have been applied to the determination of the temperature field around an underground pipe. In the electric model, which consists of an extensive net of resistances, heat conductivity is represented by electrical conductivity, and temperatures are represented by potentials; unsteady flows are created by the use both of electric capacities ("heat capacities") and special commutators introducing time-variable parameters. The problem here mentioned was solved for boundary conditions too complex for any analytical procedure. The working out of 50 variants took only 20 days of experimenting and computation.

3133

Massachusetts Inst. of Tech.
STATEMENT OF PROGRESS FOR THE PERIOD 12 FEBRUARY 1951 TO 1 MARCH 1951. John A. Clark. Mar. 1, 1951. 12p. (NP-1981)

The collection of low-velocity heat-transfer data in both boiling and nonboiling regions is completed at 2000 psia. The velocity range is from 0.04 to 1.4 fps, and the results are reported as q/A vs. Δt in graphical form for bulk temperatures from 320 to 620°F. These data are corrected for inlet cooling, and in each case the bulk temperatures were obtained from a numerical integration of q/A along the tube. A brief discussion of this material is given, and a few statements are made concerning the status of the high-pressure visual-studies test section.

3134

A STUDY OF THE HEAT-TRANSFER COEFFICIENT FOR TURBULENT FLOW IN A STRAIGHT TUBE OF ANNULAR CROSS SECTION. V. E. Mikryukov. Zhur. Tekh. Fiz. 20, 1213-25(1950) Oct. (In Russian)

For a straight tube of annular cross section, the coefficient of heat transfer from the heated inner wall into the annular space was measured in the interval of Reynolds' numbers 10^3 to 150×10^3. The temperature and velocity distributions were found to be asymmetric, and the value for the resis-

tance coefficient was found to be larger than that given by Blasius' formula. The theoretical formula of Leĭbenzon (Neftyanoe Khoz., No. 4 (1927)) seems to agree better with data found for a tube with an annular cross section than with those corresponding to a circular tube. In turbulent flow, resistance due to friction is 3.5 times as high on the inner wall as on the outer.

3135

THEORY OF APPROXIMATE SIMILITUDE IN HEAT-CONDUCTION PHENOMENA. A. I. Veĭnik. Zhur. Tekh. Fiz. 20, 295-307(1950) Mar. (In Russian)

Mathematical difficulties in handling the differential equation of heat conduction in solids of arbitrary shape can be obviated by using a method of approximate similitude of a given shape to one or another of a few fundamental simple shapes. Such a treatment is justified by the "stability property" of the heat flow, analogous to the principle of stability of flow of a viscous liquid through a pipe, according to which the velocity distribution in the pipe's cross section, at a certain distance from the entrance, is independent of the velocity distribution at that entrance. By using the approximate similitude theory, sufficiently accurate temperature values for points remote from the surface can be obtained, as well as average temperature values for points close to or at the surface of a body of complicated shape.

MATERIALS TESTING

3136

CREEP OF HIGH-PURITY ALUMINUM PLOTTED. Iron Age 167, (No. 13) 89(1951) Mar. 29.

Recent investigations by the National Bureau of Standards concerning the effects of stress and sudden changes of temperature on creep behavior of high-purity Al are briefly noted. The study included the standard creep tests made in tension at 105°F under constant load conditions, supplemented by data from interrupted tensile tests at room temperature and from other creep tests in which the test temperature was changed from 105 to 95 and back to 105°F. The extension-time curves for the constant load tests conformed generally to the well-known patterns associated with creep. The rate of change of extension with time in these tests occurred in a discontinuous manner. Discontinuous flow was also revealed at room temperature by serrated stress-strain curves.

3137

Stanford Univ.
MECHANICAL MODELS IN PLASTICITY AND THEIR USE FOR INTERPRETATION OF CREEP IN CONCRETE. Wilhelm Flügge. Nov. 30, 1950. 41p. (NP-3021)

In the first part of this paper, simple models composed of springs and viscous dampers are used to obtain a great variety of differential equations which may be used to describe the stress-strain relations of visco-elastic materials. In the second part some of these equations are applied to the interpretation of experimental results on creep in concrete, thus condensing the empirical material into a mathematical formalism which may be applied to many creep problems. (auth)

TRACER APPLICATIONS

3138

APPLICATION OF RADIOACTIVE TRACERS TO MEASUREMENTS OF FIBRE FLOW AND DISTRIBUTION. C. A. Sankey, S. G. Mason, G. A. Allen, and W. R. Keating. Pulp & Paper Mag. Can. 52, No. 3, 136-46(1951).

A method for tagging pulp fibers with I^{131} has been developed. Fibers so tagged were blended with the stock in one of a battery of six Bird screens on a newsprint machine operating at 1728 fpm. Appropriate counting techniques were applied to determine quantitatively the flow and distribution of these fibers into the finished newsprint paper. The results permit an evaluation of the blending of stock in the zone of the paper machine between the Bird screen and the point on the fourdrinier wire at which the formation becomes fixed. As applied to locally adjacent paper areas, the new technique is also pertinent to measurements of uniformity of paper. The methods described appear to have a wide potential application in the pulp and paper industry. They appreciably extend the available range of measurement, both as to quantity and time, of fiber flow between any two or more given points in a pulp system. They may be applied without interruption of regular manufacturing processes and without danger to health. Several specific additional applications are suggested. (auth)

VACUUM SYSTEMS

3139

Knolls Atomic Power Lab.
REPORT ON STATIC SEAL TEST. Walter A. Heywood. [nd.] Decl. Mar. 12, 1951. 12p. (AECD-3081)

Tests were made on a gasket-type seal of neoprene rubber. From 4 to 12 standard ½–13 holddown bolts in steps of 2 were tried. One set of data was taken with a bolt-tightening torque of 30 ft-lb and another set at 45 ft-lb. Leakage rates varied from 1.4×10^{-6} cc/sec for 4 bolts at 30 ft-lb to 0.011×10^{-6} cc/sec for 10 bolts at 45 ft-lb. (auth)

3140

NEPA Div.
OPERATION OF A FRACTIONAL-HORSEPOWER MOTOR IN A HIGH VACUUM SYSTEM. W. E. Browning and J. G. Henry. Feb. 28, 1951. 3p. (NEPA-1751)

A test was carried out to determine the feasibility of modifying a commercially available motor for service inside the vacuum system. It was determined that the high vacuum could be maintained using a reasonable pumping speed and that special cooling is not needed in the absence of air.

MINERALOGY, METALLURGY, AND CERAMICS

METALS AND METALLURGY

3141

Iowa State Coll.
THORIUM-CARBON SYSTEM. Premo Chiotti. June 5, 1950. Decl. Feb. 27, 1951. 63p. (AECD-3072; ISC-103)

A study of the Th–C system has been made, and a tentative phase diagram has been constructed from metallographic, x-ray, and melting-point data. The existence of two compounds, ThC (4.92% carbon) and ThC_2 (9.38% carbon), has been verified. Structural and physical properties of the carbide and dicarbide are discussed. A method for measuring the electrical resistance at very high temperatures is given. Automatic recording and control instruments which can be used in conjunction with this method are described. Construction details of a furnace suitable for resistance heating of test bars under vacuum or an inert atmpsphere are given. The melting points of Th–C compositions containing up to 14% carbon were determined. The temperature dependence of the electrical resistance of Th and of a number of Th–C compositions was measured.

3142

Knolls Atomic Power Lab.
DISCUSSION ON "THE CONSTITUTION OF URANIUM-MOLYBDENUM ALLOYS" BY P. C. L. PFEIL [in the Inst. Metals 77, 553-570(1950).] Charles W. Tucker, Jr. [nd.] Decl. Mar. 13, 1951. 4p. (AECD-3092)

Evidence of a direct nature that the γ phase region does not extend to room temperature, at least in the region of 20 at. % Mo, as the results of Pfeil would indicate, is presented. X-ray-diffraction examination (see also AECD-3093) of a 9.37 wt % Mo–U alloy annealed at 650°C showed strong lines of the γ phase, in contrast to the case at 450°C, where the γ phase was not stable but decomposed to form the α and a γ' body-centered tetragonal phase with cell dimensions $a_0 = 3.420$ and $c_0 = 3.278$.

3143

Knolls Atomic Power Lab.
DISCUSSION ON "THE CONSTITUTION OF URANIUM-MOLYBDENUM ALLOYS" By P. C. L. PFEIL [in the Inst. Metals 77, 553-570(1950).] Alan U. Seybolt and Robert K. McKechnie. [nd.] Decl. Mar. 13, 1951. 2p. (AECD-3093)

Microscopic evidence (see also AECD-3092) that the γ solid solution of U and Mo in the region near 20 wt % Mo is not stable at low temperatures is presented. The structure of 9.4 wt % Mo alloy after heat treatment at 450°C is illustrated. No γ phase remains in the sample, which is now a mixture of α and a distorted γ of tetragonal symmetry.

3144

Brookhaven National Lab.
THE PROPERTIES OF FERROMAGNETIC FERRITES. John P. Blewett, Martin Plotkin, and M. Hildred Blewett. [nd.] 29p. (AECU-1168)

A survey is made of the preparation and the physical, electrical, and magnetic properties of commercially available ferromagnetic ferrites. The electromagnetic phenomena and applications of ferrites are discussed.

3145

Carnegie Inst. of Tech.
ANISOTROPY OF DIFFUSION IN GRAIN BOUNDARIES. M. R. Achter and R. Smoluchowski. [nd.] 3p. (AECU-1219)

In connection with a general study of diffusion along grain boundaries, new evidence was obtained which indicates strongly that grain-boundary tension or energy alone is not sufficient to describe its state and that crystallographic aspects play a vital role. The experiment consisted of measuring diffusion of Ag along grain boundaries of columnar Cu (all grains having one cubic axis parallel to a common direction), the amount of penetration being observed by means of differential etching of Ag-rich Cu. Diffusion along a grain boundary is large along edge dislocations whenever the corresponding angle is large enough and is small perpendicular to these dislocations.

3146

Armour Research Foundation
PHASE DIAGRAMS OF ZIRCONIUM-BASE BINARY ALLOYS; REPORT NO. 1; JANUARY 1 – MARCH 1, 1951. Donald J. McPherson and M. Hansen. Mar. 3, 1951. 25p. (AECU-1223)

Preliminary steps in the study of phase diagrams of the binary systems of Zr with Sn, Mo, Cu, W, Cr, Si, Al, and Mg are reported. The nonconsumable-electrode arc-melting furnace to be used is illustrated, and other facilities and plans are discussed. Possible phase relationships in binary Zr-rich alloys are analyzed. Results of a check on the temperature of the $\alpha \rightleftharpoons \beta$ allotropic transformation in Zr metal are presented. Investigation of the Zr–Sn system is partly complete. Microphotographs of alloys containing 9.46, 19.40, 24.13, 30.60, and 40.69 wt % Sn are shown. The following conclusions are drawn: (1) There is an intermediate phase at approximately 40 wt % tin, corresponding to the formula Zr_2Sn. (2) A eutectic between Zr and Zr_2Sn is located between 19.4 and 24.1% tin. (3) There is a wide solubility of tin in β Zr, extending to a limit, perhaps, of 15 to 20% tin.

3147

Carnegie Inst. of Tech.
THEORY OF GRAIN BOUNDARY MOTION. R. Smoluchowski. [nd.] 6p. (AECU-1224)

A theory of the migration of grain boundaries as a whole is developed, based upon Mott's model of the grain boundary. The basic mechanism of motion of a grain boundary is considered as a transfer of a group of atoms from the lattice of one grain to the disordered state at the grain boundary and a transfer of a group of atoms from the disordered

boundary layer to the crystalline lattice of the other grain. The two processes are somewhat analogous to melting and solidifying. To make the theory more specific, mobilities of grain boundaries have been calculated for Ag, Al, and brass and are compared with experimental data from the literature. Lines of fruitful investigations are suggested.

3148

Battelle Memorial Inst.
NOTES FROM THE SECOND METALLOGRAPHY CONFERENCE AT BATTELLE MEMORIAL INSTITUTE ON JANUARY 11, 1950. H. A. Saller and R. F. Dickerson. Jan. 11, 1950. 12p. (AECU-1235)

The metallographic techniques used by various laboratories to prepare and examine Ti, Zr, Be, and V metals and Ti–U alloys are discussed briefly. Grinding and polishing techniques and compositions of etchants and electrolytic baths are outlined.

3149

Sylvania Electric Prodicts, Inc.
PRELIMINARY INVESTIGATION CONCERNING THE FORMATION OF ZIRCONIUM-MAGNESIUM ALLOYS BY POWDER METALLURGICAL METHODS. Henry H. Hausner and Herbert S. Kalish. Sept. 21, 1950. 14p. (SEP-38)

Zr–Mg alloys may have an application in conjunction with the extensive work being done on Zr. Preliminary tests were made to determine the type of alloying which may occur on the Zr-rich side of the system. The rapid volatilization of Mg above its melting point would necessitate high-pressure melting techniques in an extremely pure inert atmosphere. Powder metallurgy techniques wherein the melting process can be avoided is a more desirable approach. Preliminary work on mixtures containing 3, 5, 10, and 15 at. % Mg revealed that these alloys can be formed by powder metallurgy methods. On account of the mere informative character of these tests, the results presented are only of a preliminary nature.

3150

Sylvania Electric Co.
THE POWDER METALLURGY OF ZIRCONIUM. Henry H. Hausner, Herbert S. Kalish, and Roswell P. Angier. Jan. 19, 1951. 41p. (SEP-52(X))

An investigation has been made of the powder metallurgy of Zr. Preparation of the powder was accomplished by the hydride method. It is shown that the use of Zr hydride powder in the fabrication techniques has many advantages over the use of Zr powder. The pressing and sintering conditions for producing Zr by powder metallurgy have been established. Both types of powder were found to compact easily and to sinter at a fairly low temperature to the theoretical density of Zr. The properties of sintered Zr were investigated. The studies included the ultimate density of sintered Zr as a function of compacting pressure, a correlation of grain growth with densification, and the factors affecting hardness and resistivity of the sintered product. Sintered Zr was found to have good ductility.

3151

NEPA Div.
INTERMETALLIC COMPOUNDS IN THE SYSTEM MOLYBDENUM-BERYLLIUM. Samuel G. Gordon, James A. McGurty, and Gilbert E. Klein. Jan. 10, 1951. 14p. (NEPA-1686)

Data obtained from coupled Mo–Be specimens heated at temperatures between 2000 and 2400°F for 100 hr have revealed the existence of two intermetallic compounds produced by solid diffusion. The Mo-rich phase is identified as $(MoBe_2)_4$ (C6/mmc) which crystallizes in the form of tabular hexagonal crystals. Its unit cell constants are $a_0 = 4.433$ A, $c_0 = 7.341$ A; its theoretical density is 6.06 g/cc. The Be-rich phase is identified as $(MoBe_{13})_4$ (P42), which was found to crystallize in the form of prismatic tetragonal crystals. This is a new phase, whose existence has not been previously reported. Its unit cell constants are $a_0 = 10.27$ A, $c_0 = 4.29$ A; its theoretical density is 3.13 g/cc. (auth)

3152

Battelle Memorial Inst.
MOLYBDENUM ALLOYS AND PROTECTION BY CLADDING. W. L. Bruckart, S. J. Whalen, R. I. Jaffee, and B. W. Gonser. Apr. 25, 1950. 148p. (R-200(RAND))

Molybdenum and Molybdenum-Base Alloys Prepared by Powder-Metallurgy Techniques. The experimental work reported covers 58 different compositions in 10 alloy groups, including unalloyed Mo, in the form of 0.040-in. strip finish rolled at 1250°C and annealed 30 min at 1100°C. Mechanical properties of the alloys were in general superior to those of unalloyed Mo. Outstanding binary alloys, on the basis of room-temperature mechanical properties, were 0.25% Co, 0.25% Fe, 0.25% Si, 1% Cr, and 40% W. Outstanding on the basis of ease of fabrication, combined with good mechanical properties, was the 0.25% Si alloy. The alloy with the best strength-ductility characteristics contained 0.25% Co. The strongest alloy produced contained 40% W. Cladding of Molybdenum. An evaluation of the processing and properties of three kinds of commercially available Mo clad with a variety of potentially useful cladding materials is presented. In all cases, the composites produced were of the double-clad type, usually with cladding thicknesses of 15% per side, although some work was done with thinner clads. Cladding on Mo was done successfully with Pt–10Rh, Ni, Inconel, and 18-8 stainless steel (type 302), the bond strengths decreasing in the order given. On the basis of qualitative tests, the bonding of Mo to the Pt alloy appeared to be best. Unsuccessful cladding was found when 25-20 stainless steel (type 310), 27-Cr ferritic steel (type 446), Hastelloy B, and Stellite 21 were tried as cladding materials. 33 tables. 104 figures.

3153

THE PERMEABILITY OF ZIRCONIUM TO HYDROGEN. Richard B. Bernstein and Daniel Cubicciotti. J. Phys. & Colloid Chem. 55, 238-48(1951) Feb.

Measurements of the rate of permeation of H_2 through Zr at elevated temperatures are reported. A sketch of the

apparatus used and descriptions of the vacuum system and H_2 purification are presented. Results are plotted in terms of time dependence of the permeability, temperature and pressure dependence, and effect of sample thickness.

3154

SOME PROPERTIES OF THE LIQUID METAL MELT Bi + Cd + Sn + Pb. K. G. Akhmetzyanov, V. E. Mikryukov, and Ya. A. Turovskiĭ. Zhur. Tekh. Fiz. 20, 203-21(1950) Feb. (In Russian)

As a part of a general study of the liquid state, results are reported of an investigation of the mixture of 31.20% Pb, 50.30% Bi, 8.80% Sn, and 9.70% Cd in the molten state, in the temperature range 100 to 700°C. The temperature dependences of the melt's viscosity, thermal and electrical conductivities, density, and heat capacity were determined by methods partly newly devised and partly specially adapted from those used for metals in the solid state.

3155

Massachusetts Inst. of Tech.
THERMAL CONDUCTIVITY OF 347 STAINLESS STEEL AND ZIRCONIUM. L. R. Vianey. Feb. 15, 1951. 6p. (NP-1989)

The thermal conductivities of 1-in.-diam 347 stainless steel and 0.626-in.-diam crystal-bar Zr rods 1 ft in length have been measured. Heat transferred along the axis was absorbed in a water calorimeter at the end, and temperature gradient was measured by thermocouples at 3-in. intervals. All data obtained are tabulated and plotted.

PHYSICS

3156

Brookhaven National Lab.
INFORMATION AND THE HUMAN EAR. Homer Jacobson. [nd.] 49p. (AECU-1097)

Calculations of the informational capacity of the human ear are made by computing the number of discriminable sound patterns per second and applying the Shannon information theory. A maximum of 10^4 binary digits (bits)/sec transmission is found. This is compared with the capacity of existing auditory channels and recording media and with the rate of actual information perception from speech and music. It is shown that a capacity of upward from 5×10^4 bits/sec, depending on the informational match to the ear, is necessary for high-fidelity transmission or recording. It is also shown that the brain can utilize less than 1% of the information transmitted by the ear. Finally, an average capacity of about 0.3 bit/sec, or of 40 tones/sec, is calculated for an individual cochlear fiber. (auth)

3157

Office of Naval Research, London
CONFERENCE ON FERROMAGNETISM AND ANTIFERROMAGNETISM, UNIVERSITY OF GRENOBLE, FRANCE, JULY 3-7, 1950. P. W. Forsbergh and P. M. Marcus. Dec. 22, 1950. 51p. (ORNL-114-50)

Brief résumés of most of the papers, which were not of a review nature, given at the Grenoble Conference on Ferromagnetism and Antiferromagnetism are reported. Among the new topics discussed were the following: measurements of antiferromagnetism at very low temperatures; microwave ferromagnetic resonance; the effect of order and disorder on magnetic properties; the quantum theory of superexchange interaction; antiferromagnetism theory; high-frequency permeability of ferromagnetics and Bloch wall dynamics; coercivities of very fine powders; ferromagnetic perovskite structures. Topics of longer standing which were discussed included: powder patterns of ferromagnetic domains, magnetostriction measurements, the theory of ferromagnetism, measurements of saturation magnetization and susceptibility of metals, alloys and ferrites, magnetic viscosity and magnetomechanical-gyromagnetic ratios. (auth)

3158

MEETING OF THE VERBAND DEUTSCHER PHYSIKALISCHER GESELLSHAFTEN. Angew. Chem. 62, 581-3 (1950) Dec. 21. (In German)

The newly founded Union of German Physical Societies held its first meeting in Bad Nauheim on Oct. 11-15, 1950. Abstracts of papers read at the meeting are given here. The following reports were among those presented: Continuous Isotope Separation, by E. David; Density and Temperature Measurements of Gases by Observations on the Absorption of Particles, by E. Schopper, B. Schumacher, and D. Knapp; Structure Changes Produced by α-Ray Bombardments, by B. Stech; and Scattering Measurements on Atoms and Molecules with the Aid of Intersecting Molecular Beams, by R. Jaeckel and W. Jawtusch.

COSMIC RADIATION

3159

Brookhaven National Lab. and Smith Coll.
ON FLUCTUATIONS AND THE GENERAL DISTRIBUTION PROBLEM IN ELECTRON CASCADES. W. T. Scott. Oct. 30, 1950. 22p. (AECU-1194)

Recent developments are applied to the general probability distribution problem of electron cascades (cosmic-ray showers). In particular, it is shown that the master function giving the probability of any number of particles with any given energy distribution at a depth t in a shower is determined, in principle, by the average energy spectrum. Certain theorems connecting the various functions are derived, and a discussion is given of the as yet unsolved problem of getting satisfactory analytic or numerical re-

sults from the formalism. Only the simplified model originated by Furry (Phys. Rev. 52, 569(1937)) has been discussed, but the theorems embody many properties of the actual electron-photon multiplication process. (auth)

3160

ANOMALIES IN THE ABSORPTION CURVE OF COSMIC RAYS IN LEAD. Estrella Mazzolli de Mathov. Nature 167, 192-3(1951) Feb. 3. (Letter to the editor)

Brief note is made of anomalies found in the sea-level absorption curve obtained at Buenos Aires (lat. 34° 35′ 30″). Thickness of Pb (in steps of 0.5 cm) were placed above triple-coincidence counter tubes. A maximum intensity was obtained for a 13-cm absorber thickness, 2.5 times the standard deviation.

3161

HIGH ENERGY COSMIC-RAY SHOWERS IN NUCLEAR EMULSIONS. L. S. Osborne. Phys. Rev. 81, 239-44(1951) Jan. 15.

A detailed and statistical study of high-energy events in nuclear emulsions exposed at high altitudes has given some information on a model to describe the showers found in cosmic rays. There is evidence shown that shower multiplicity increases with primary energy. Differences in the behavior of events from heavy and light nucleus collisions are described. From multiplicity and angular spread of the tracks in individual events, arguments are presented to support a pluromultiple model for meson production in high-energy collisions with a nucleus. (auth)

3162

NEUTRAL COSMIC RAYS PRODUCED IN THE SUN. L. Biermann, O. Haxel, and A. Schlüter. Z. Naturforsch. 6a, 47-8(1951) Jan. (In German)

It is shown that charged particles, accelerated in the outer layers of the sun's atmosphere, can, during their subsequent falling back, bombard nuclei and thus produce neutrons. Although the efficiency of this process (measured by the ratio between the number of neutrons leaving the sun and the number of accelerated charged particles) is probably of the order of 10^{-3} only, the effect might be observable, since it is known that charged particles whose energy is below that of the cut-off energy of the earth's magnetic field contribute to the production of neutrons. (auth)

3163

THE NEUTRONS FROM THE NUCLEONIC COMPONENT AS AN INDICATOR OF CHANGES IN PRIMARY INTENSITIES. J. A. Simpson, Jr. Phys. Rev. 81, 895-6(1951) Mar. 1. (Letter to the editor)

A brief comparison is made between the meson component and the neutrons from the nucleonic component as to accuracy and reliability as indicators in low-altitude observation of the fluctuations of the primary cosmic-ray intensity.

3164

ON THE ORIGIN OF COSMIC RAYS. Alessandro Amerio. Atti accad. nazl. Lincei, Classe sci. fis. mat. e nat., (8) 9, 9-15(1950) July-Aug. (In Italian)

The following hypothesis points to one of the possible sources of the cosmic radiation. Granules of matter of the order of 1000 A in diameter can be projected from stars through the action of light pressure which, in the case of hot stars, is very much greater than the resisting gravitation. As a consequence, such granules travel in interstellar space with high velocities. Upon reaching the upper levels of the earth's atmosphere, some of the granules' atoms collide with nuclei of the air and liberate high-energy protons, mesons, etc., which form the cascades of the cosmic-ray atmospheric showers. The granules end their career in a meteoritic disintegration. The sun is not hot enough to produce notable effects of the kind described.

3165

A SEARCH FOR COSMIC-RAY DIURNAL EFFECTS AT BALLOON ALTITUDES. T. A. Bergstrahl and C. A. Schroeder. Phys. Rev. 81, 244-7(1951) Jan. 15.

In two balloon flights in Minnesota a search was made for diurnal effects in the cosmic radiation at altitudes above 50,000 ft. Measurements were made simultaneously of the total ionizing radiation, γ radiation in the energy range of approximately 0.75 to 5 Mev, and fast neutrons. The ionizing radiation and γ-radiation component was measured by means of a central horizontal counter tube surrounded by a closely packed ring of horizontal counters. Coincidences between the central counter and the outer ring determined the ionizing radiation, and anticoincidences gave the intensity of the γ radiation. The neutron flux was measured by two BF_3 counters, one filled with enriched BF_3, mounted side by side in a vertical paraffin cylinder of 8 in. diam surrounded by Cd. No diurnal effects were observed. The statistical accuracy of this measurement is on the order of 1% for the total ionizing radiation, 3% for the γ radiation, and 2% for the neutron measurement. (auth)

ELECTRONS

3166

THE MASSES OF THE NEGATIVE AND POSITIVE ELECTRONS. Jesse W. M. DuMond. Phys. Rev. 81, 468-9(1951) Feb. 1. (Letter to the editor)

A difference between the masses of positive and negative electrons is indicated by a discrepancy found between the direct measurement of the annihilation radiation from Cu^{64} by DuMond et al. (Phys. Rev. 75, 1226(1949)) and the value of the Compton wavelength, $\lambda = h/mc$, obtained by the author, where m is clearly the mass of the negative electron. The measurement of DuMond et al. was the larger by about 4 parts in 10^4. The discrepancy may be interpreted as a relative difference in the masses $(m^- - m^+)/m^- = 0.82 \times 10^{-4}$.

INSTRUMENTS

3167

Knolls Atomic Power Lab.
LEVEL AND LEAK INDICATORS. L. B. Vandenberg. Dec. 20, 1949. Decl. Mar. 12, 1951. 12p. (AECD-3083; Memo-LBV-2)

A Na level indicator using electrical resistance as the principle gave the following results: It was possible to read the level accurately to within 2% of the actual level at constant temperature. The temperature range from 100 to 450°C was covered. The error introduced by temperature was linear. It caused approximately 5% error in level per 100°C temperature change over a 15½-in. range of levels. Test results of the indicator agree closely with calculations. The indicator and other d-c measuring equipment had no effect on each other. The principle can be adapted to monitor pipes, valves, and containers for liquid-metal leaks. 10 figures. (auth)

3168

Brookhaven National Lab.
MAGNETIC ELECTRON MULTIPLIERS FOR DETECTION OF POSITIVE IONS. Lincoln G. Smith. Sept. 19, 1950. 23p. (AECU-1057)

Two designs of 15-stage electron multipliers, wherein focusing from one beryllium copper dynode to the next occurs in crossed electric and magnetic fields, are described. They have been developed particularly for detection of weak beams or pulses of positive ions in magnetic fields. One, with dynodes ⅜ in. wide, is usable in fields between about 250 and 460 oersteds, whereas the other, with dynodes ⅛ in. wide, is usable in fields between about 300 and 100 oersteds. Advantages of these designs over previously described multipliers employing crossed fields are: the use of about half the number of insulated plates and less tendency because of uniformity of the electric field for breakdown and noise caused by occurrence of ion feedback. The uniformity of the electric field also allows reliable calculation of the spread in transit time.

3169

Los Alamos Scientific Lab.
RAY TRACING USING THE IBM CARD PROGRAMMED ELECTRONIC CALCULATOR. William A. Allen and Richard H. Stark. [nd.] 15p. (AECU-1102; LADC-826)

The IBM Card Programmed Electronic Calculator has been applied to the problem of lens design. Optical design is an inverse process consisting of a provisional choice of optical parameters, an exhaustive mathematical study of such a tentative prescription, and subsequent refinement of the lens system. The standard ray-tracing equations can be adapted easily for machine use. The mathematical treatment is algebraic rather than trigonometric. Examples of meridional and skew ray tracing are given. A satisfactory lens has been calculated and tested entirely by machine methods. The machine is expected to be of value in the refining of optical systems, in the determination of optical shop tolerances, and in the investigation of existing prescriptions. (auth)

3170

Ames Lab.
A SIMPLE ARC IGNITER FOR D.C. ARC SPECTROCHEMICAL ANALYSIS; CONTRIBUTION NO.139. Richard K. Brehm and Velmer A. Fassel. Jan. 17, 1951. 3p. (AECU-1119)

A greatly simplified igniter for low-voltage arcs requiring only a Tesla coil of the vacuum-testing type, an auxiliary gap, and an inductance is described and shown schematically. Simplification is achieved by mounting the circuit components closer to the analytical gap to prevent loss of the high-frequency current.

3171

Brookhaven National Lab.
A COMBINED CURRENT INDICATOR AND INTEGRATOR. W. A. Higinbotham and S. Rankowitz. [nd.] 9p. (AECU-1140)

An instrument is described which combines a current integrating circuit and a d-c amplifier to provide a continuous indication of the current being integrated. The instrument is stable and easy to calibrate and can be made to cover a wide range of input currents from 0.1 to 500 μa full scale. A basic circuit and a detailed circuit diagram are included.

3172

Radio Corp. of America
QUARTERLY REPORT; ELECTRONIC DEVICES FOR NUCLEAR PHYSICS; OCTOBER 1950 – JANUARY 1951. G. A Morton, Director. [nd.] 10p. (AECU-1176)

A Large Cathode Photomultiplier for Scintillation Spectrometry. The photomultiplier described has a circular, nearly flat photocathode of 65-cm² area (3⅛ in. diameter). A three-element electron-optical lens system focuses the photoelectrons into a narrow pencil and directs them onto the first dynode of a 10-stage multiplier structure. Uniformity and high collection efficiency of the photocurrent are featured. For use in γ-ray spectroscopy cylindrical crystals as much as 10 cm in diameter and 10 cm in height have been used. Pulse-amplitude Analyzer. Difficulties in maintaining within narrow limits the threshold current at which the output circuit of an analyzer tube containing 100 targets (one for each channel of the analyzer) must actuate are considered. Theoretical explorations of a slit analyzer, the possibility of a coarse followed by a fine analysis, a pulse comparator, delayed cross control, and a transmission line sieve have been made. Experimental work has begun on the last apparatus, in which the unknown pulse is fed into a transmission line containing shunt capacitors which are the deflection plates of cathode-ray tubes the output of which actuates the associated counter and inactivates all the following tubes. The numerous advantages of this system are listed.

3173

Knolls Atomic Power Lab.
GENERAL PRINCIPLES FOR INSTRUMENTATION IN RADIOACTIVE SYSTEMS. C. A. Hansen, Jr. [nd.] 15p. (AECU-1195)

Radioactive systems include nuclear, chemical, and physical processes. In each general field the operations may be quite diverse in character and present different problems with respect to instrumentation. In order to instrument a process, it must be defined, and the conditions under which a variable is to be measured must be known. Some of the individual processes under the broad headings of nuclear, chemical, and physical operations are outlined, some general rules for instrumentation in radioactive systems are established, and future progress needed in materials, manufacturing methods, measurement methods, and standardization of remote-manipulating methods are discussed.

3174

Brookhaven National Lab.
A FLEXIBLE PULSE AMPLIFIER WITH GOOD OVERLOAD PROPERTIES. R. L. Chase and W. A. Higinbotham. [nd.] 11p. (AECU-1245)

A general-purpose linear pulse amplifier with good stability, short rise time, and good overload characteristics is described. The basic circuit consists of two long-tailed pairs in a negative feed-back loop containing a small amount of positive feedback inside the loop. (auth)

3175

Radiation Lab., Univ. of Calif.
A TRANSMISSION ELECTRON MULTIPLIER; A PRELIMINARY STUDY. (thesis) Donald R. Cone. Nov. 1, 1950. 57p. (UCRL-1030)

Preliminary work has been done on the construction of a transmission-type electron multiplier tube, wherein the initial electrons are accelerated and focused onto the face of a thin foil with sufficient energy to penetrate the foil and produce secondaries on the far side. These secondaries in turn are accelerated to an adjacent foil where the process is repeated. A cathode-ray-tube gun was used as the initial source of electrons. For the first test, a Be foil about 10-μ in. thick was used, with a secondary-to-primary ratio of 1.7 for 4.6-kv incident electrons. The final experiments were conducted with formvar films about 4-μ in. thick, with a thin layer of Be evaporated on the emergence side. With these foils, ratios of 2.5 were achieved with 3- to 8-kv incident electrons. In both cases, the secondary to primary ratio was increasing with electron energy, so the figures given do not indicate a limit. From the results, it seems conclusive that a multistage transmission multiplier could be built giving a useful gain with a reasonable over-all accelerating volgage. (auth)

3176

Research Lab. of Electronics, Mass. Inst. of Tech.
AMPLIFIERS WITH PRESCRIBED FREQUENCY CHARACTERISTICS AND ARBITRARY BANDWIDTH. TECHNICAL REPORT NO. 163. John G. Linvill. July 7, 1950. 61p. (NP-1987)

The limitation of shunt capacitance on vacuum-tube amplifier performance; design technique applicable both for narrow and broad-band cases, which require, respectively, one chain and a number of paralleled chains; the distributed amplifier; noise consideration in amplifier design. 18 references.

3177

Naval Research Lab.
ANALYZER OF MOTION OF GASEOUS IONS; PART I; trans. from J. phys. radium (7), 10, 177-88(1949). Paul Langevin. 1950. 34p. (NRL-Trans-299)

This report is a translation from the French of the original article, an abstract of which appeared in Nuclear Science Abstracts as NSA 3-1703.

3178

Office of Naval Research, London
DEFORMATION-TESTING DEVICES AT THE CAVENDISH LABORATORY, CAMBRIDGE. Amos J. Shaler. Dec. 28, 1950. 5p. (ONRL-1-51)

Four devices used on testing laboratory machines are described. One of them mechanically and optically magnifies the deflection of a circular weighing diaphram for the measurement of tensile loads in yield-point investigations. Another records loads in a tensile-testing machine of high rigidity; it consists of a very hard weighbar, the extension of which is optically magnified and recorded. A third device is a photoelastic load-recording unit used with a high-speed compression plastometer. The fourth is a device used to apply a constant load in a creep-testing machine; it is actuated by creating a vacuum in one of a pair of metallic bellows, the spring-action of which is canceled by means of a negative spring. Drawings are included.

3179

A HIGH-PRECISION MAGNETIC-FIELD MEASURING INSTRUMENT. Paper presented at the 1951 Institute of Radio Engineers National Convention, New York, Mar. 19-22. R. W. Kane, E. C. Levinthal, and E. H. Rodgers.

An abstract of this paper appeared in Proc. I.R.E. 39, 309 (1951) Mar. and is reproduced here in its entirety.

This paper is concerned with the description of an instrument using the principles of nuclear induction designed to measure and control magnetic fields with a precision much greater than heretofore available. Essentially the technique reduces the problem of measuring magnetic fields to one of measuring frequencies. Using these principles, fields have been controlled to 0.0002%. Relative measurements of the field are possible to the same accuracy, and the absolute value of a field in gauss can be determined to Bureau of Standards precision. The instrument can indicate field inhomogeneities as small as 0.003 gauss/cm and thus permits rapid shimming of magnetic fields to achieve large, very homogenous regions. The design of the instrument is described, and practical problems encountered and solved in its application are discussed.

3180

Office of Naval Research, London
INFRA-RED GAS ANALYZERS. W. Lewis Hyde. Jan. 8, 1951. 3p. (ONRL-2-51)

A new gas analyzer of exceptional stability is reported. In this instrument the absorption due to the sample in one beam is compensated automatically by a shutter moving in the other beam. By this null-balance technique, stability is obtained. Since the instrument is always in a state of balance, the calibration is free of error due to changing source intensity, changing receiver senstivity, or the errors of the amplifier.

3181

Washington Univ.
A MAGNET-COIL WINDING APPARATUS; TECHNICAL REPORT NO. 8. O. Retzloff. Feb. 28, 1951. 9p. (NP-1982)

A description is given of apparatus for winding bobbins consisting of "pies" for an electromagnet. Each pie is wound with 1 by ⅛ in. Cu strap; the insulator is 2 by 0.006 in. strip Fiberglas folded longitudinally over the Cu and held with an adhesive. Photographs and a drawing are included.

3182

A SIMPLE THERMOSTAT ACCURATE TO WITHIN ±0.0005°C. P. A. Finogenov. Zhur. Tekh. Fiz. 20, 480-2(1950) Apr. (In Russian)

A simple thermostatic device is described, in which the instrument to be kept at a constant temperature is placed, with a stirrer and a thermometer, in a small Cu container filled with water; this container is immersed in the water of a conventional laboratory thermostat container provided with a stirrer, two heating plates of Nichrome wire, a cooling coil, and a Hg-toluene contact thermometer. Although in the outer container the temperature oscillated within ±0.01°, in the inner container the oscillations did not exceed ±0.0005°.

ISOTOPES

3183

Brookhaven National Lab.
PRODUCTION OF IODINE-132; I. INTRODUCTION. W. E. Winsche, L. G. Stang, Jr., and W. D. Tucker. [nd.] 12p. (AECU-1202)

The advantages to medical and biological investigations of the short life, high-energy β and γ radiation, and lack of radioactive descendants of I^{132} may now be utilized. The isotope is shipped from Brookhaven National Laboratory as the parent 77-hr Te^{132} in a solid eutectic mixture of LiCl and KCl (m.p. 365°C). The special container is fitted with an electric heater to melt the solid solution and an air bubbling device to sweep out the I^{132}. Equations and graphs are given which permit quick determination of the frequency of sweeping required to obtain a maximum or a definite quantity of I^{132}.

MATHEMATICS

3184

Carbide and Carbon Chemicals Div., UCC, K-25
AN ITERATIVE METHOD FOR SOLVING SYSTEMS OF LINEAR EQUATIONS. A. de la Garza. Feb. 15, 1951. 15p. (K-731)

An iterative method for solving systems of linear equations is presented. The basis for the method is a systematic reduction of the sum of squares of residuals by which trial solutions may be improved to a desired accuracy. Remarks on application of the method are included. (auth)

3185

Carbide and Carbon Chemicals Div., UCC, K-25
A SEQUENTIAL TEST FOR THE NUMBER OF DEFECTIVES IN A FINITE POPULATION. P. B. Wood. Feb. 28, 1951. 16p. (K-737)

A sequential testing procedure is developed for classifying finite populations as acceptable or nonacceptable where acceptability depends on the number of defective items in the population. An example is worked in detail, and the application of the plan to some types of auditing problems is suggested. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

3186

Westinghouse Atomic Power Div.
SOME ASPECTS OF FISSION COUNTER DESIGN. W. Baer and O. Swift. Jan. 15, 1951. Decl. Feb. 26, 1951. 9p. (AECD-3066; WAPD-RM-34)

Results of experiments are reported which show that coatings of U_3O_8 as great as 2.0 mg cm^{-2} may be used in a fission counter to give an increase in sensitivity provided the discriminator setting is low enough that the additional low-energy fission fragments, which result from the added thickness of coating, will be counted. The lower limit to the discriminator setting was determined by the α-particle cut-off value which is sufficiently low to permit the use of a 2.0-mg cm^{-2} coating. In addition, the electrode spacing was decreased to as little as 0.150 in. with no significant sacrifice in sensitivity. (auth)

3187

Argonne National Lab.
A METHOD FOR THE DETERMINATION OF NEUTRON FLUX. F. Jankowski and A. Wattenberg. Oct. 16, 1950. Decl. Mar. 12, 1951. 24p. (AECD-3082)

The technique of measuring the absolute neutron flux by activating thin metal foils (Au, in this experiment) has been investigated in detail. The measurement of neutron flux in a beam was carried to completion first, and since the difficulties encountered were similar to those arising in other neutron measurements, it was believed advisable to report this in detail and make the measurement of an isotropic neutron flux the subject of a second report. The uncertainties arising in this flux determination are indi-

cated, and some estimates are given. These uncertainties arise from potential errors in the techniques employed and generally not from the statistical errors of measurement. The accuracy in the absolute activity determination could be improved considerably if a more efficient γ-ray counter were available. These uncertainties and errors, with that in the value of the mean life, lead the authors to believe that the uncertainty in this absolute flux determination is approximately 3% at the present time.

3188

Brookhaven National Lab.
BETA CALIBRATION RACK USING URANIUM OXIDE. W. C. Herman. [nd.] 3p. (AECU-1150)

Brief note is made of a film-holding apparatus employed in β calibration of film dental packets used in personnel monitoring. This device is constructed of $\frac{5}{8}$-in. plywood of dimensions $9\frac{1}{4}$ by $12\frac{3}{4}$ in. and holds 20 film packets. The specified time of exposure is preset on a timer, which at the end of the desired time releases a catch letting the rack open by spring tension.

3189

Brookhaven National Lab.
A SURVEY METER FOR MEASURING SOFT BETA RADIATIONS IN THE ATMOSPHERE. Seymour Block. [nd.] 11p. (AECU-1170)

An instrument for use as a survey meter for monitoring gaseous atmospheric contamination has been built. This instrument consists of an ionization chamber and a Victoreen type electrometer. Its use involves introducing the radioactive sample into the chamber and noting the time of travel of the fiber across the scale of the electrometer. Laboratory and field applications are discussed.

3190

Brookhaven National Lab.
RADIATION DOSES FROM DIAGNOSTIC X-RAY STUDIES. John S. Handloser and Robert A. Love. [nd.] 7p. (AECU-1177)

It was feared that diagnostic x-ray procedures might tend to cause the maximum permissible dose of radiation workers to be exceeded. Methods were therefore devised to calibrate the x-ray apparatus used by the Medical Department. Values for the different types of diagnostic roentgenograms of the machines used at BNL are recorded as obtained by using Al filters and from x-ray-tube data.

3191

Massachusetts Inst. of Tech.
COMPARISON OF A HIGH-PRESSURE ION CHAMBER AND GM TUBES FOR CONTINUOUS RADIOASSAYING IN AN ORE PLANT. James H. Pannell and Donald W. Haney. Feb. 15, 1951. 9p. (MITG-A112)

The Chalk River ionization chamber model TPA and two new types of G-M tubes were tested in the search for detectors of radioactivity which would be reliable over long periods and under adverse conditions. The limitations of this investigation prevented the inclusion of all types of γ detectors, but of those tried, the high-pressure ion chamber and the halogen-quenched G-M tube were found to be superior to other devices. The investigations have shown the feasibility of utilizing the natural radioactivity of the U disintegration series to assay ores, pulps, and products of physical separations continuously and to record the analytical data. Even products of some chemical separations, viz., acid leach solutions, may be analyzed through β counting, and a continuous record may be made. The ultimate separation of U from all its daughter elements provides an opportunity for the application of α counting, which may, likewise, be done continuously.

3192

Oak Ridge National Lab.
CONSTRUCTION AND OPERATION OF A VARIABLE PRESSURE EXTRAPOLATION CHAMBER. T. E. Bortner. Mar. 19, 1951. 20p. (ORNL-905)

A conventional type of extrapolation chamber has been redesigned and enclosed in an airtight brass and lucite case. The response of the chamber has been studied with air pressures ranging from 10^{-3} mm Hg to 6 atm, and the proportionality of ionization to pressure has been verified. This design permits the use of dry air and other gases, provides somewhat greater sensitivity in the linear range and, when used with vacuum, makes possible certain observations on primary charged particles. 9 figures. (auth)

3193

Oak Ridge National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING OCTOBER 31, 1950. W. E. Thompson, comp. Mar. 15, 1951. 56p. (ORNL-924)

Chemistry Division. A circuit is shown for a scintillation survey meter designed for maximum γ sensitivity. Pulse analysis using photographic density measurements is discussed in detail, and experiments with a stationary film and densitometer are reported. Progress on instrumentation for neutron diffraction is reported. Specifications and circuit descriptions are given for a reliable linear count-rate meter and a high-stability, low-drain, portable high-voltage supply. Health Physics Division. Work on instrumentation and techniques for waste-disposal studies, a constant water monitor, and a r-f high-voltage supply is reported briefly. Instrument Department. Brief summaries of work on numerous vacuum systems, instruments, meters, etc., are presented. An r-f ion source and a liquid-level telemeter are illustrated, and certain results of accelerator-tube design studies are outlined. Physics Division. A split-crystal scintillation β spectrometer and a total-absorption spectrometer are described. Response curves to P^{32}, Cs^{137}, and Co^{60} radiations are shown. A circuit diagram and description of a single-channel pulse analyzer are given.

3194

Atomic Energy Project, Univ. of California, Los Angeles
GAMMA SCINTILLATION COUNTERS FOR BIOLOGICAL AND MEDICAL APPLICATIONS. Benedict Cassen, Lawrence Curtis, and Clifton Reed. Feb. 2, 1951. 11p. (UCLA-114)

Work on the directional γ detector previously described (UCLA-49; Nucleonics 6, No. 2 (78-80(1950)) has been continued. Several other types of counters designed specifically for biological and medical applications are described, and their performances and limitations are indicated. Some physical aspects of their clinical application are discussed.

3195

NEPA Div.
CONSTRUCTION OF A THIN-LENS BETA SPECTROMETER AND PAIR SPECTROMETER. F. E. O'Meara. Feb. 14, 1951. 24p. (NEPA-1694)

An iron-free thin-lens β spectrometer has been built by closely following the design of Jensen et al. (Phys. Rev. 75, 458(1949)). The construction and adjustment of the spectrometer are discussed, and the γ spectrum of Ta^{180} determined with the apparatus is illustrated. Twenty-four γ-ray energies are listed. A rough check of the As^{76} γ spectrum also is shown. A modification of a conventional lens-type β-ray spectrometer for use as a pair spectrometer is suggested. This has not been constructed owing to consideration of the difficulties in producing the semicircular counter required.

3196

THE EFFICIENCY OF GEIGER-MÜLLER COUNTERS FOR THE HIGH ENERGY γ-RAYS. III. Masateru Sonoda. J. Phys. Soc. Japan 5, 408-12(1950) Nov.-Dec.

Generally speaking, when an electron or γ quantum of high energy enters a substance, there may occur a multiplication process similar to a cosmic-ray shower. An investigation is made of the penetration probability, using a method similar to that in shower theory, based on the preceding paper (II) (see NSA 5-668). 20 references.

3197

FORMATION OF AN ELECTRON-RELEASING REGION IN COUNTERS FILLED WITH VAPOR ONLY. H. Neuert. Z. Physik 129, 27-32(1951) Jan. 29. (In German)

A photon-caused spreading of the discharge has been observed in counters filled with pure gases. The photons, originated from excited states of atoms and molecules, release electrons on the cathode, starting thereby new discharge cascades. In the case of a gas-plus-vapor filling, excitation radiations from the gas, by ionizing vapor molecules, can also produce a thin cylindrical region filled with ions. Again, in the presence of sufficiently mobile ions, collisions of positive ions with atoms and molecules will probably cause similar spreadings of the discharge. However, in a pure vapor filling none of these mechanisms can be adduced for an explanation of the spreading observed. It is shown that its probable cause is a short-wave ultraviolet radiation appearing as the electrons recombine with positive ions. (auth)

3198

THE HARWELL TIME-OF-FLIGHT NEUTRON SPECTROMETER. A. W. Merrison and E. R. Wiblin. Nature 167, 346-7(1951) Mar. 3.

The details of the Harwell time-of-flight spectrometer, including the accelerator, control mechanism, vacuum system, and time-of-flight measuring circuits are described briefly. Some performance figures are given, and a comparison is made with those of other spectrometers. The spectrometer is now arranged to cover the energy region 1 ev to 1 kev.

3199

NUCLEAR EMULSION TECHNIQUE. V. D. Hopper. Australian J. Sci. Research 3A, 512-14(1950) Sept. (Short communication)

Experiments on cosmic rays are being carried out using Ilford G-5 nuclear research emulsions, which are capable of recording particles at very low ionizing power. With careful development it is possible to record tracks of particles moving at velocities giving minimum ionization, although it is still impossible to trace slow electron paths with certainty. In carrying out experiments with these emulsions in Australia, it is necessary to transport the plates from England by plane or ship, and during transit the plates are affected by cosmic radiation and tropical conditions. A method for the development of a so-affected 400-μ-thick emulsion on glass is reported. A summary of data from exposed plates is tabulated. A mosaic of exposed plates of a π meson coming to rest and disintegrating into a μ meson, which in turn comes to rest before disintegrating into an electron at minimum ionizing energy, has been assembled.

3200

ON THE ASSUMED INTERNAL CONVERSION OF THE KINETIC ENERGY OF ELECTRONS OF β^- RADIOACTIVE SUBSTANCES. B. Brunelli and D. Cunsolo. Nuovo cimento 7, 847-54(1950) Oct. 15. (In Italian)

Cloud-chamber tracks that could be interpreted as produced by positrons were recognized as due, instead, to electrons coming from the walls. A glass support carrying a Pb^{214} and Bi^{214} source was placed in the middle of the chamber, whereupon the number of such tracks was found to be considerably larger than that observed when the holder was empty. It was concluded that all these tracks are produced by negative electrons from collisions at the wall. Such tracks have been reported by several authors and, in spite of theoretical difficulties, were interpreted by them as due to positrons of pairs generated through an internal conversion of the kinetic energy of the β^- emission. The literature of the question (since 1935) is given.

3201

ON THE BEHAVIOR OF COUNTERS FILLED WITH NH_3. H. Neuert and J. Geerk. Ann. Physik (6) 8, 93-8(1950) Nov. 10. (In German)

As in counters filled exclusively with vapors, the discharge mechanism in NH_3-filled counters is based mainly on the absorption by the gas of photons formed during the process. After 10^7 to 10^8 pulses a light-sensitive layer is formed on the cathode. The mass spectrometer shows the presence of considerable quantities of N_2 and H_2 in the gas filling after a large number of pulses. These two gases are formed in a series of chemical reactions originated by H atoms that

are freed through the action of electrons and photons on the filling during the discharge. However, since some of these reactions lead back to NH_3, the lifetime of a NH_3-filled counter is longer than that of the majority of counters containing vapors as part of the filling. (auth)

3202

QUANTUM EFFICIENCY OF BISMUTH COUNTERS FOR ELECTROMAGNETIC RADIATION OF 0.07-MEV TO 2.8-MEV ENERGY. R. J. Hart, K. Russel, and R. M. Steffen. Phys. Rev. 81, 460-1(1951) Feb. 1. (Letter to the editor)

Brief note is made of a study of the quantum efficiency of G-M counters. The efficiency is determined as a function of the energy of the incident radiation, using γ radiation of the energy region 0.07 to 2.8 Mev. Counter tubes were of the cylindrical type containing bismuth cathodes.

3203

THE r-UNIT AT 320 AND 160 MEV. Edwin M. McMillan, Wade Blocker, and Robert W. Kenney. Phys. Rev. 81, 455(1951) Feb. 1. (Letter to the editor)

A method is presented for the standardization of the r unit, calibrated in terms of absolute x-ray energy per unit area, as an absolute measurement of the intensity of a beam of high-energy x rays. The suggested standard arrangement consists of a Victoreen thimble chamber inside an open-ended lead cylinder placed with its axis transverse to the x-ray-beam direction. Calibrations are made for two energy regions, 320 and 160 Mev, with results of 1.04×10^7 and 1.38×10^7 as the "effective quanta"/cm^2, respectively.

3204

A SIMPLIFIED CHEMICAL METHOD OF RADIATION DOSIMETRY. M. E. J. Carr. Nature 167, 363-4(1951) Mar. 3. (Letter to the editor)

Brief note is made of an attempt to simplify the method of measuring doses of ionizing radiation by eliminating the Folin-Ciocalteu reagent used in the estimation of the phenols produced in dilute aqueous solutions of benzene. The phenol has been measured directly by using its ultraviolet absorption at 2700 A. The method is less sensitive than that employing the Folin-Ciocalteu reagent, but for doses greater than 5000 r consistent results have been obtained.

3205

Atomic Energy Research Establishment
THE STATISTICAL SIGNIFICANCE OF COUNTS DIFFERING ONLY SLIGHTLY FROM THE MEAN BACKGROUND LEVEL. D. J. Behrens. Jan. 1951. 8p. (AERE-T/R-640)

It is shown that, when an activity gives rise to a count differing only slightly from the mean background, the statistical mean activity may be well above the excess of the count over the background. Quantitative tables are included. (auth)

3206

A STUDY ON PROPORTIONAL COUNTERS. V. A. Trofimova. Zhur. Tekh. Fiz. 20, 1141-6(1950) Sept. (In Russian)

The dependence of the amplifying coefficient of a proportional counter on the position of the source of ionizing particles within the counter was investigated using various gas fillings. Whereas for A, CH_4, C_2H_4, and C_3H_8 no such dependence was observed, for fillings with air, methylal, and A + C_2H_5OH the amplifying coefficient is higher when the ionizing particles are formed in the vicinity of the filament than when the particles are formed near the tube.

3207

Naval Research Lab.
UPPER ATMOSPHERE RESEARCH REPORT NO. XI; A NOTE ON THE GEOMETRY OF GEIGER COUNTER TELESCOPES. Homer E. Newell, Jr., and Eleanor C. Pressly. Aug. 8, 1950. 16p. (NRL-3715)

The contribution of a portion of the solid angle of a two-counter telescope to the total coincidence rate is studied for both isotropic and cosine-squared-law radiation fields. Formulas and graphs are presented for estimating the percentage of counts due to radiation from directions near the telescope axis. The average path length traversed by particles passing through the telescope is touched upon briefly. (auth)

MESONS

3208

Radiation Lab., Univ. of California
RANGE, KINETIC ENERGY, and B ρ FOR π AND μ MESONS IN LEAD. J. De Pangher. Dec. 12, 1950. 12p. (UCRL-1048)

The range in Pb, magnetic rigidity, and kinetic energy for π and μ mesons of mass 275 and 210 have been calculated and are presented in tabular and graphical form.

3209

Radiation Lab., Univ. of California
π^+ MESON MASS DETERMINATION. W. F. Cartwright, C. Richman, M. Whitehead, and H. A. Wilcox. Jan. 23, 1951. 3p. (UCRL-1096)

Brief note is made of measurements of the cross section for production of π^+ mesons by proton-proton interaction. The mass of the π^+ meson has been measured as 275.1 $\pm$ 2.5 m_e. (See also UCRL-665; NSA 4-3975; and Phys. Rev. 78, 823 (1950).)

3210

LOW ENERGY ELECTRON RESULTING FROM A STOPPED μ-MESON. Gerhart Groetzinger, Lewis B. Leder, and

Fred L. Ribe. Phys. Rev. 81, 626(1951) Feb. 15. (Letter to the editor)

Brief note is made of the observation in cloud-chamber experiments of a stopped μ meson resulting in the emission of a negative electron with an energy of 70 kev. A total of three stopped mesons has been observed, of which only one was accompanied by the emission of a charged particle.

3211

THE MECHANISM OF ABSORPTION OF NUCLEAR MESONS BY NUCLEI. Pierre Cüer. Compt. rend. 231, 846-8(1950) Oct. 23. (In French)

The author previously had formulated a two-step theory of meson absorption consisting in (1) instantaneous ($\sim 10^{-22}$ sec) absorption of a π^- meson by a proton to produce a fast neutron and a recoil nucleon, or a D, T, He^4, or heavier fragment, and (2) a secondary phenomenon ($\sim 10^{-20}$ sec) in the course of which the fast neutron or the recoil particle or both heat the nucleus, which evaporates particles according to its structure and degree of excitation. In the present note the author considers recent experimental data and interpretations of meson absorption and concludes that this theory is compatible with these.

3212

ON THE DECAY OF THE π^- MESON. L. Lederman, J. Tinlot, and E. T. Booth, Phys. Rev. 81, 281-2(1951) Jan. 15. (Letter to the editor)

The spontaneous decay of π^- mesons produced by the bombardment of an internal carbon target was observed directly in a cloud chamber. From a series of 28 such events, the mass of the μ^- meson was found to be $210 \pm 6\ m_e$.

3213

ON THE MECHANISM OF EMISSION OF NUCLEAR MESONS BY THE NUCLEUS. Pierre Cüer. Compt. rend. 231, 899-901(1950) Oct. 30. (In French)

A possible analogy between the absorption and the simple emission of π mesons by nuclei which seems to explain the principal experimental results in this field is presented. A primary interaction between the incident particle and a nuclear subgroup such as an α-particle group is hypothesized. The relation of this mechanism to experimental excitation functions for carbon (Bradner, UCRL-486; NSA 4-1456) is discussed. It is concluded that these instantaneous subgroups play a part in all high-energy nuclear phenomena.

3214

PRODUCTION OF π MESONS IN NUCLEON-NUCLEON COLLISIONS ACCORDING TO PSEUDOSCALAR THEORY. Jacques Prentki. Compt. rend. 231, 1434-6(1950) Dec. 18. (In French)

Expressions for the cross sections for production of charged and neutral π mesons in nucleon-nucleon collisions have been derived using techniques introduced by Feynman. These are nonrelativistic approximations in the center-of-mass system. A discussion of the equations leads to the following conclusions: (1) the angular distribution in the center-of-mass system is isotropic, (2) the cross sections depend on the total charge and are independent of the type of charge or symmetry of the nuclear forces, (3) in the emission of a charged meson the contribution of the neutral mesons is small, and analogously for the emission of a neutral meson. Neither a purely charge exchange nor a purely neutral exchange theory of nuclear forces is satisfactory for the pseudoscalar case. A symmetric theory is indicated.

3215

PROOF OF GENERATION OF NEUTRAL MESONS BY PHOTONS. Yu. Khokhlov. Uspekhi Fiz. Nauk 42, 313-14 (1950) Oct. (In Russian)

The work of Steinberger et al. (Phys. Rev. 78, 802(1950)) on the creation of neutral mesons during the bombardment of Be targets by γ rays from a synchrotron, and on the disintegration of those mesons into pairs of photons, is reviewed briefly.

3216

PROPERTIES OF MESONS. H. P. Noyes. Nature 167, 170-2(1951) Feb. 3.

A detailed summary is presented of the properties and characteristics of μ, charged and neutral π, and heavy mesons. 28 references.

MOLECULAR STRUCTURE

3217

THE DETERMINATION OF THE STRUCTURES OF COMPLEX MOLECULES AND IONS FROM X-RAY DIFFRACTION BY THEIR SOLUTIONS: THE STRUCTURES OF THE GROUPS $PtBr_6^{--}$, $PtCl_6^{--}$, $Nb_6Cl_{12}^{++}$, $Ta_6Br_{12}^{++}$, and $Ta_6Cl_{12}^{++}$. Philip A. Vaughan, J. H. Sturdivant, and Linus Pauling. J. Am. Chem. Soc. 72, 5477-86(1950) Dec.

A solution of a strongly scattering solute in a weakly scattering solvent yields an x-ray-diffraction pattern which closely approximates the diffraction pattern from a gas of the solute molecules. The visual estimation method has been applied to analyze the diffraction patterns from several solutions, and the structures of several complex molecules have thereby been determined. Suitable photographs were obtained with tungsten $K\alpha$ radiation monochromatized by crystal reflection. For aqueous chloroplatinic and bromoplatinic acids the diffraction data correspond to an octahedral PtX_6 group. Diffraction patterns from ethanol solutions of $Nb_6Cl_{14}.7H_2O$, $Ta_6Br_{14}.7H_2O$, and $Ta_6Cl_{14}.7H_2O$ are consistent with the assumption of a group M_6X_{12} in which the metal atoms are at the corners of a regular octahedron and the halogen atoms are on the radial perpendicular bisectors of the edges of this octahedron. The

shortest interatomic distances in the M_6X_{12} groups are as follows:

Compound	M–M, A	M–X, A	X–X, A
$Nb_6Cl_{14}.7H_2O$	2.85	2.41	3.37
$Ta_6Br_{14}.7H_2O$	2.92	2.62	3.64
$Ta_6Cl_{14}.7H_2O$	2.88	2.44	3.41

These results agree reasonably well with distances calculated on the basis of Pauling's theory of intermetallic distances. (auth)

3218

National Research Council of Canada
INTERNAL ROTATION AND ROTATIONAL ISOMERISM; trans. from Uspekhi Khim. 13, 234-52(1944). M. V. Volkenshtein; tr. by E. Rabkin. Aug. 1950. 48p. (TT-149)

The rotation of atoms and groups around a singular σ bond was found to take an expenditure of a definite amount of work in order to overcome a barrier of 3 to 10 kcal/mole. This barrier is reported to be considerably higher for the π bond. At room temperature the barrier was surmounted in less than 10^{-4} sec. From a practical point of view, free rotation is assumed in relation to the chemical properties. Data on the height of the barrier, and therefore on the degree of hindrance of rotation, are reported from investigations of the specific heats, dielectrics, and other properties of molecules. Information has also been obtained by electronography and Raman spectroscopy. Experiments show that the most stable configurations of hydrocarbon molecules and their derivatives in liquid and solid states is the "trans"-configuration. The phenomenon of inner rotation is reported of primary importance for optical activity, determining on one side the velocity of racemization, and on the other the value of optical activity itself. Due to the fact that the period of natural vibrations of a molecule has a value of nearly 10^{-14} sec — much less than the time of residence of the individual stable forms of a hindered rotation — the Raman spectrum (and also electronography) made it possible to reveal the phenomenon of rotational isometry. Rotational isomers of many fatty compounds, mainly of the halogen derivatives, were also studied. 94 references.

NEUTRONS

3219

Los Alamos Scientific Lab.
PREPARATION OF A MOCK FISSION NEUTRON SOURCE. Don S. Martin. Apr. 15, 1946. Decl. Feb. 19, 1951. 17p. (AECD-3077; LA-552; LADC-911)

A procedure is described by which a neutron source with a fission spectrum (mock fission) was prepared. Polonium was used as the α source in the amount of 26.6 curies, and the target material was a mixture of $NaBF_4$ and $2NaF_2.BeF_2$ (mole ratio B/Be = 96/4). A gas-distillation technique was used for the preparation, and the resulting Po-target-material mixture was pressed into a hard pill which was contained in a cylindrical capsule, 0.317 in. in diam and 0.25 in. long. When assembled, the source fitted inside a sphere 1.03 cm in diameter. The neutron yield was 3.85×10^6 n/sec or 1.46×10^5 n/curie sec. (auth)

3220

Los Alamos Scientific Lab.
A STUDY OF THE SPECTRUM OF THE NEUTRONS OF LOW ENERGY FROM THE FISSION OF U^{235}. T. W. Bonner. Dec. 2, 1948. Decl. Mar. 27, 1951. 11p. (AECD-3110; LA-715; LADC-912)

A cloud chamber has been used to determine, in the energy range 0.05 to 0.7 Mev, the distribution of prompt neutrons produced by the fissions of U^{235} in a thermal-neutron beam. The ratio of proton recoils in the energy range 0.05 to 0.6 Mev to the recoils in the energy range 0.6 Mev to infinity was also determined. The data are compared with two formulas and are found to fit one which also fits the data obtained by Hill and Watt (Report LA-1010, Vol. 3). (auth)

3221

Oak Ridge National Lab.
TRANSPORT PARAMETERS FOR THERMAL NEUTRONS IN WATER. Francis Joseph Sisk. Mar. 15, 1951. 44p. (ORNL-933)

Appropriate average values of the neutron cross sections for normal water (required to solve the transport problem) have not been accurately known. Those values which best fit the transport solutions to experiment have been determined. Findings may be tabulated as follows:

Parameter, water at 24°C	Values
Diffusion length	2.67 ± 0.02 cm
Transport mean free path	0.48 ± 0.01 cm
Absorption mean path (equivalent)	44.2 ± 1.3 cm
Microscopic transport cross section	62.4 ± 1.5 barns/mole
Microscopic absorption cross section (equivalent)	0.68 ± 0.01 barn/mole
Ratio — boundary flux ÷ asymptotic (exponential) flux	0.186
Ratio — boundary flux ÷ asymptotic (hyperbolic) flux	0.87
Extrapolation distance — X_0	0.32 cm
Ratio — extrapolation distance/ Total mean path	0.67

Comparison of the cross section with the energy-dependent values for protons in water indicate an "average" neutron energy for transport of perhap 0.05 ev in contrast with the Maxwell-Boltzmann mode of 0.025 ev. This is not surprising since it is expected that transport is largely effected by the high-energy neutrons which have longer free paths. In addition, the neutron flux is weighted by a velocity term so that the average flux corresponds to a higher energy than does the average neutron, and transport weights the cross section by the flux rather than by the neutron density. The 1/v absorption in hydrogen provides a preferential sink for low-energy neutrons, thus the thermal distribution is displaced from the Maxwell-Boltzmann toward higher energy. (auth)

3222

PRODUCTION OF HIGHLY POLARIZED NEUTRON BEAMS BY BRAGG REFLECTION FROM FERROMAGNETIC CRYSTALS. C. G. Shull. Phys. Rev. 81, 626(1951) Feb. 15. (Letter to the editor)

High polarization of neutron beams has been observed using as reflector a thin slice of Fe_3O_4 cut along the (220) planes of a natural, single crystal of magnetite and magnetized in the field of a permanent magnet. A monochromatic beam of neutrons (1.204 A) was reflected from the (220) planes with the crystal slice set in transmission orientation and with the magnetization vector perpendicular to the plane of scattering. The degree of polarization was found to be approximately 100%. The polarization reflections of Co and Fe crystals also are considered briefly.

NUCLEAR PHYSICS

3223

Radiation Lab., Univ. of California
PHYSICS DIVISION QUARTERLY REPORT; AUGUST, SEPTEMBER, AND OCTOBER 1950. Dec. 19, 1950. 30p. (UCRL-1057)

A new rectangular, piston-type cloud chamber is illustrated and discussed. Events observed in G5 emulsion exposed to 200-Mev electrons and positrons are listed, and film studies of grain density as a function of energy loss, meson focusing in a spectrometer, and fast protons produced in π^- meson capture are summarized briefly. Improvements in the electronic methods of counting photon pairs from neutral-meson decay are discussed. Brief statements are made of the status of experiments on the energy spectra of protons scattered from light elements, π^+ meson counting technique, deuteron-proton scattering, activities from the α bombardment of Pb, proton-proton scattering (differential cross sections at 119, 164, and 249 Mev are tabulated), range-energy relation for 340-Mev protons, photo production of neutral mesons in liquid H_2, mass determination of π^- and π^0 mesons, 300-Mev pair spectrometer, coincidence between π^+ mesons and deuterons in P-P collisions, C^{12}-ion acceleration, synchrotron studies, theoretical physics, and operation and development of the 184- and 60-in. cyclotrons, synchrotron, linear and van de Graaff accelerators, and the bevatron. A γ-ray NaI(Tl) scintillation counter has been constructed for which the amplifier circuit and counting-rate curves for various γ-ray energies are given. An iron snout to bring the 60-in.-cyclotron beam to a region free from the cyclotron magnet field is described, and a schematic diagram of the arrangement is given.

3224

THE INTERPRETATION OF METASTABLE NUCLEAR ENERGY LEVELS. Arne Lundby. In Forsvarets Forskningsinstitutt, Årbok II, 1948-49, 18-28.

A theory is given of selection rules governing the various transitions from metastable states (γ transitions between isomers and β decays of both isomers into neighboring nuclei) and of the energy-lifetime relation in metastable states.

NUCLEAR PROPERTIES

3225

Radiation Lab., Univ. of California
THERMAL NEUTRON FISSION OF Am-241. B. B. Cunningham and A. Ghiorso. Dec. 21, 1950. Decl. Mar. 7, 1951. 2p. (AECD-3075; UCRL-1060)

The mean value of the thermal-neutron fission cross section of Am^{241}, as computed from several measurements on purified ½- to 1-μg samples of Am irradiated in the Argonne heavy-water pile, was 3.0 ± 0.2 barns, consistent within the experimental errors of the measurements themselves.

3226

Argonne National Lab.
SPIN-ORBIT COUPLING IN Li^7 AND Be^7. D. R. Inglis. Dec. 21, 1950. 26p. (AECU-1125; UAC-334)

The magnetic spin-orbit coupling of the p-shell nucleons is shown to have the right sign and about half the magnitude to account for the 45-kev difference of the first excitation energies, 479 kev in Li^7 and 434 kev in Be^7, if these are interpreted as doublet splittings due mainly to a spin-orbit coupling term of the same form as the Thomas term but stronger and presumably of mesonic origin, such as seems to be responsible for the appearance of (j,j) coupling in heavy nuclei. Be^7 is expected to be slightly larger than Li^7 because of the added Coulomb repulsion, so the average value of the main term is expected to be smaller for Be^7, and it is estimated that this Coulomb expansion explains another one-fourth of the splitting difference, leaving about one-fourth unaccounted for. These estimates are made both very simply by means of the droplet model and more reliably by minimizing the energy obtained with exchange interactions and three-dimensional isotropic oscillator wave functions. Energies attributed to spin-orbit coupling in other nuclei indicate that the main term should make the Li^7 and Be^7 doublet splittings about 50% larger than observed, which suggests that second-order perturbations may reduce both by nearly the same amount, leaving their estimated difference significant. The possibility of more drastic perturbations and their relation to the quadrupole-moment problem are discussed. The agreement of the estimated splitting difference in sign and order of magnitude is consistent with other evidence favoring the (L,S)-coupling interpretation that the two low states form a ^3P. (auth)

3227

Brookhaven National Lab. and Argonne National Lab.
LOW ENERGY NEUTRON CROSS SECTIONS OF BISMUTH. (abstract). H. Palevesky, D. J. Hughes, and C. Eggler. Mar. 1, 1951. 1p. (AECU-1214)

The report is reproduced here in its entirety.

The low-energy scattering, absorption, and activation cross sections of Bi are being measured in order to determine the properties of a Bi mirror. Several noteworthy results, which have no special reference to mirrors, have been obtained from the measurements to date. The absorption cross section (at 2200 m/sec velocity), measured by the effect of Bi on pile reactivity, is 30 millibarns, while the activation cross section (for the 5-day Bi^{210}) is only 15 millibarns. Chemical and spectroscopic analyses, as well as intense neutron irradiation, reveal no impurities in the various purified Bi samples used. It is possible that the excess absorption leads to the long-lived α emitter ascribed by

Neumann, Howland, and Perlman (Phys. Rev. 77, 720(1950)) to an isomeric state of Bi^{210}, although such a large cross section would imply an exceedingly long-lived isomer ($\sim 10^9$ yr). The inelastic as well as the spin-dependent scattering is being measured with the Brookhaven slow chopper for neutrons of wavelength 6 to 23 A. In this wavelength range the inelastic scattering departs widely from the proportionality to λ that is expected theoretically and that has been observed in several other materials.

3228

Purdue Univ.
MEMORY IN ANGULAR CORRELATION OF THE γ-RAYS EMITTED FROM EXCITED STATES OF Cd^{111}. D. M. Roberts and R. M. Steffen. [nd.] 1p. (AECU-1236)

The report is reproduced here in its entirety.

Cd^{111} has a metastable state of 247-kev excitation energy which decays with a half-life of 0.08 μsec to the ground state of spin ½. This transition is preceded by a γ ray of 173-kev quantum energy. The angular correlation between the 173- and the 247-kev γ rays emitted in the decay of In^{111} to Cd^{111} has been measured using a coincidence amplifier with a resolving time of 0.12 μsec. The measured points follow within experimental error the angular correlation function $f(\theta) = 1 - (R/Q) \cos \theta$ with $R/Q = 0.06 \pm 0.02$. Measurements repeated with the same resolving time but with a 0.13-μsec delay showed the same result, indicating that the spin orientation of the intermediate 0.08-μsec state does not change appreciably before the emission of the 247-kev γ ray. The measured correlation function is characteristic for a dipole and a quadrupole transition between levels of angular momenta ⅝, ⅜, and ½. The conversion of the 173- and the 247-kev γ rays indicates a magnetic dipole and an electric quadrupole transition, respectively.

3229

Argonne National Lab.
NUCLEAR MAGNETIC MOMENT OF Rb^{85}, Rb^{87}, AND I^{127}. E. L. Yasaitis and Bernard Smaller. Mar. 1951. 3p. (AECU-1249; UAC-374)

The nuclear resonance absorption technique (side-band modulation) of Smaller et al. (Phys. Rev. 80, 137(1950); 81, 896(1951)) has been used to determine the following ratios of resonant frequencies (uncorrected for diamagnetic effects); $f_H/f_{Rb^{85}} = 10.357105 \pm 0.000030$, $f_H/f_{Rb^{87}} = 3.0561097 \pm 0.0000055$, and $f_H/f_{I^{127}} = 4.99763 \pm 0.00015$. Using the assigned spin values of ½ and ⅜ for the Rb^{85} and Rb^{87} isotopes, respectively, the ratio of the moments is found to be $\mu_{Rb^{87}}/\mu_{Rb^{85}} = 2.0333905 \pm 0.0000075$. The indicated error for all these figures is three times the probable error.

3230

THE ATOMIC MASSES OF H^1, C^{12}, AND S^{32}. Alfred O. Nier. Phys. Rev. 81, 624(1951) Feb. 15. (Letter to the editor)

The masses of H^1, C^{12}, and S^{32}, determined relative to O^{16} by the doublet method with a double-focusing mass spectrometer, were found to be 1.008165 ± 0.000004, 12.003842 ± 0.000006, and 31.982218 ± 0.000025, respectively.

3231

GYROMAGNETIC RATIO FOR THE PROTON AND IMPROVED VALUES OF e/m. Uspekhi Fiz. Nauk 42, 321-3(1950) Oct. (In Russian)

Recent developments in the magnetic resonance method permit very accurate measurements of gyromagnetic ratios. The work by Thomas et al. (Phys. Rev. 78, 787(1950)) on the proton is reviewed. From the value of the gyromagnetic ratio obtained, the magnetic moment of the proton and the specific charge of the electron have been calculated. A diagram shows the results of measurements of e/m since 1930.

3232

NUCLEAR MAGNETIC MOMENTS AND ATOMIC HYPERFINE STRUCTURE. Aage Bohr. Phys. Rev. 81, 331-5(1951) Feb. 1.

The asymmetric nuclear model discussed in a previous paper (Phys. Rev. 80, 134(1951) Jan. 1) provides the basis for a more detailed interpretation of nuclear magnetic moments than the single particle model permits. The structure of the moment which the model implies may be tested by a study of the influence of the finite size of the nucleus on the atomic hfs. This effect was investigated previously in cooperation with Weisskopf and is considered more closely in the present paper with the assumption that the nuclei in question can be described in terms of a single particle moving in an asymmetric nuclear core. The K isotopes should be well represented by this model, and for these nuclei the theoretical value obtained for the hfs is in close agreement with the observed data. Also for the Rb isotopes the agreement is satisfactory. (auth)

3233

THE NUCLEAR SPIN OF Be^9. H. S. Gutowsky, R. E. McClure, and C. J. Hoffman. Phys. Rev. 81, 635-6(1951) Feb. 15. (Letter to the editor)

A study of the nuclear spin of Be^9 shows it to have the value ⅜. By observation of the detailed line shape of the F^{19} magnetic resonance in vitreous BeF_2, ½ has been eliminated as a possible value. Similar observations for K_2BeF_4 make a value of ½ also unlikely.

3234

A NUCLEAR SPIN SYSTEM AT NEGATIVE TEMPERATURE. E. M. Purcell and R. V. Pound. Phys. Rev. 81, 279-80(1951) Jan. 15. (Letter to the editor)

Experiments are performed on a LiF crystal to determine the effects of sudden reversals of magnetic fields on the crystal. The state of spin system immediately after this treatment is described by a negative spin temperature. Indications are that the spin system is able to follow changes in even a small field adiabatically unless they occur in a time presumed to be less than about 20 μsec.

3235

ROTATIONAL MAGNETIC MOMENTS IN POLYATOMIC MOLECULES. C. K. Jen. Phys. Rev. 81, 197-203(1951) Jan. 15.

There is generally present in a molecule a small magnetic moment associated with its rotational degree of freedom. The rotational g factor can be measured by an experimental method based upon the Zeeman effect. Previously, the most successful measurements have been made with the molecular-beam resonance technique. More recently, the microwave Zeeman splitting of molecular rotation lines has offered another method for the determination of rotational g factors. With this method, the g factors of several molecules such as NH_3, H_2O, OCS, etc., have been measured. The quantum-mechanical theory of the rotational magnetic moment of the symmetric top molecule has been developed, and the experimental results are discussed qualitatively in the light of this theory. (auth)

3236

TWO-BODY NUCLEAR INTERACTION, CONSISTENT, WITHIN THE LIMITS OF A SINGLE CONFIGURATION, WITH THE SPIN AND MAGNETIC MOMENT OF THE GROUND-STATES OF LITHIUM-6, BORON-10 AND LITHIUM-7. J. P. Elliott and H. A. Jahn. Nature 167, 32-3(1951) Jan. 6.

The matrix elements of the nuclear interaction are evaluated for the levels arising from the nuclear $s^4p^2(Li^6)$, configurations and for the levels of maximum orbital symmetry of $s^4p^6(B^{10})$ configuration, using oscillator wave functions. Using the measured magnetic moment of Li^6 to determine the S-D admixture in its ground state, a relationship is deduced for the consistency with spin 1 for the ground state of Li^6. Agreement is also obtained with the magnetic moment of B^{10} and Li^7 (spin 3 and ½, respectively).

NUCLEAR REACTORS

3237

Los Alamos Scientific Lab.
HIGH-POWER WATER BOILER. F. L. Bentzen, R. E. Carter, J. Hinton, L. D. P. King, J. C. Nevenzel, R. E. Schreiber, J. W. Starner, and P. H. Watkins. Sept. 19, 1945. Decl. Feb. 27, 1951. 82p. (AECD-3065; LADC-822)

A detailed description of the design and construction of the 5.5-kw water boiler at Los Alamos is given. A 14%-enriched uranyl nitrate solution in water is used as the reactor and moderator. The 13.5 liters of solution, containing 870 g of U^{235}, are held in a 1-ft-diam stainless-steel sphere. The tamper consists of a BeO core surrounded by graphite. A thermal column is connected to one side of the tamper. The operation and performance of the boiler are desribed. 34 figures. (auth)

NUCLEAR TRANSFORMATION

3238

Los Alamos Scientific Lab.
EVIDENCE FOR AN EXCITED STATE OF He^5. Wallace T. Leland and Harold M. Agnew. [nd.] 5p. (AECU-1225; LADC-970)

Tritium gas was bombarded with tritons, of 426- to 906-kev energy in the gas target, and the neutrons at 0 deg were detected by means of 200-μ Ilford C2 emulsions. Two distinct energy groups of neutrons were revealed. These neutron groups are most reasonably accounted for by the assumption that they arise from the reactions $t + t \rightarrow He^5 + n + 10.53$ Mev and $t + t \rightarrow He^{5*} + n + 7.9$ Mev.

3239

DETECTION OF GAMMA-RAY POLARIZATION BY PAIR PRODUCTION. G. C. Wick. Phys. Rev. 81, 467-8(1951) Feb. 1. (Letter to the editor)

A notation from a paper by Berlin and Madansky (Phys. Rev. 78, 623(1950)) on the azimuthal dependence of pair-production cross sections is used as a basis of a study of the detection of γ-ray polarization by pair production.

3240

GAMMA-ALPHA-REACTION IN Rb^{87}. R. N. H. Haslam and H. M. Skarsgard. Phys. Rev. 81, 479-80(1951) Feb. 1. (Letter to the editor)

This note describes the study of the (γ,α) processes by means of the activity in an unstable product nuclide. Samples of $RbNO_3$ were irradiated in the University of Saskatchewan betatron at peak energies ranging from 15 to 27.4 Mev. A pure 140-min activity, arising from Br^{83}, was observed. The activity curve was obtained after appropriate corrections for geometry, self-absorption, back-scattering, etc. The cross-section curve for the reaction $Rb^{87}(\gamma,\alpha)Br^{83}$ shows a maximum at 22.5 Mev, a half-width at 6.6 Mev, and an integrated cross section of 4×10^{-4} Mev-barn.

3241

HIGH ENERGY PHOTO-PROTONS FROM CARBON. Darcy Walker. Phys. Rev. 81, 634-5(1951) Feb. 15. (Letter to the editor)

Protons with energies up to 124 Mev were observed coming from a carbon target bombarded by γ rays from an electron synchrotron operated at 195 Mev. The γ-ray beam was passed through a 1.3-cm hole in a Pb block and allowed to impinge on a carbon plate placed 45 deg to the beam. The protons emitted from the target at angles of 135, 90, 60, and 30 deg were recorded by stacks of photographic plates interleaved with Al absorbers.

3242

THE $Li^6(n,\alpha)H^3$ REACTION SPECTRUM. Ugo Facchini, Emilio Gatti, and Elio Germagnoli. Phys. Rev. 81, 475-6 (1951) Feb. 1. (Letter to the editor)

Measurement of the energy of α and H^3 particles emitted in the $Li^6(n,\alpha)H^3$ reaction by slow neutrons has been undertaken. The α and H^3 energy spectrum was observed from thin layers of LiF and UO_2 present simultaneously on the emitting electrode of a grid ionization chamber exposed to a flux of slow neutrons from a 500-mc Ra-Be source. The energies of the

α and H^3 particles generated from Li fission are 2.051 ± 0.017 and 2.748 ± 0.014 Mev, respectively, with respective Q values of 4.786 ± 0.043 and 4.809 ± 0.024 Mev.

3243

PHOTO-DISINTEGRATION OF COPPER. P. R. Byerly, Jr., and W. E. Stephens. Phys. Rev. 81, 473-4(1951) Feb. 1. (Letter to the editor)

Protons ejected from a Cu foil irradiated with the bremsstrahlung from a 24-Mev betatron were observed in nuclear emulsions. In the process of determining the photoproton energy distribution, several anomalies suggested the possibility of the presence of photodeuterons. By grain counting the ends of the tracks, it was possible to differentiate deuterons from protons, and a considerable number of deuterons were found. The energy, angular distribution, and relative numbers of protons, deuterons, and also α particles were determined.

3244

PHOTODISINTEGRATION OF THE DEUTERON AT SOME INTERMEDIATE ENERGIES AND THE NEUTRON-PROTON EFFECTIVE TRIPLET RANGE. J. H. Carver and D. H. Wilkinson. Nature 167, 154-5(1951) Jan. 27. (Letter to the editor)

Brief note is made of the results of a study of the photodisintegration of the deuteron by γ rays of 4.45 to 17.6 Mev and the neutron-proton effective triplet ranges deduced in terms of the square and Yukawa wells.

3245

THIN-TARGET YIELD OF $^{15}N(p,\alpha)^{12}C$. R. T. Pauli and C. Mileikowsky. Nature 167, 155-6(1951) Jan. 27. (Letter to the editor)

Brief note is made of the relative yield of the reaction $N^{15}(p,\alpha)C^{12}$ investigated with a target of isotopically separated gas bound in a metal lattice. Thin targets of N^{15} were prepared in an electromagnetic isotope separator by bombarding Ag plates with the mass-15 beam for about 5 hr. The thin-target yield of α particles leaving the C^{12} nucleus was studied at 90 deg to the incident beam, resulting in the observation of one resonance at 340 kev in the energy region 220 to 940 kev.

RADIATION ABSORPTION AND SCATTERING

3246

Columbia Univ. and Brookhaven National Lab.
THE COHERENT SCATTERING CROSS SECTION AND NUCLEAR RESONANCES OF TELLURIUM; abstract for APS Chicago Meeting; November 24th and 25th C. J. Heindl, I. W. Ruderman, and R. J. Weiss. [nd.] 1p. (AECU-1148)

The report is reproduced here in its entirety.

Recent small-angle neutron scattering measurements show that the coherent scattering cross section of tellurium is much smaller than the free scattering cross section. This can be explained by assuming that one of the tellurium isotopes has a strong resonance and a negative scattering length. Transmission measurements on normal isotopic tellurium with the Columbia neutron velocity spectrometer confirm the presence of a strong resonance at 2.2 ev and a number of smaller resonances at higher neutron energies. Further transmission data on an enriched sample of Te containing 76.5% of Te^{124} are being obtained to determine whether the resonance at 2.2 ev is to be attributed to this isotope. The incoherent, and from it the coherent, cross sections of Te are being determined by a scattering experiment with the neutron spectrometer. This experiment utilizes an annular bank of BF_3 counters placed at an angle of 18 deg with respect to the neutron beam. Only incoherently scattered neutrons are counted when the incident neutron energy is greater than 2.5 A. Thus, the incoherent cross section may be determined as a function of neutron energy.

3247

Brookhaven National Lab.
n-D SCATTERING AT 1.4 MEV. A. M. Thorndike and A. W. Wotring. Nov. 24, 1950. 2p. (AECU-1181)

The following abstract of a speech for the American Physical Society meeting in New York, January 1951, is reproduced here in its entirety.

Neutrons of 1.35 to 1.50 Mev were produced by deuteron bombardment of carbon with the Brookhaven Van de Graaf. A beam defined by a paraffin collimator passed through a deuterium-filled cloud chamber, and the angular distribution of recoil deuterons was observed. Background was reduced by shielding the cloud chamber. From a total of 1027 recoil tracks, 374 had position, range, and angle within acceptable limits. For these tracks the background correction was from 4 to 20%. The data show frequent backward scattering in the center-of-mass system and are consistent, within satistical uncertainties, with the ordinary force curve of Buckingham and Massey. The same result has been found at higher energies, but these results do not rule out the possibility of agreement with improved exchange force calculations.

3248

Ames Lab.
CORRECTIONS REQUIRED IN CLOUD CHAMBER STUDIES OF ELECTRON MOMENTUM DISTRIBUTIONS. Robert L. McKenzie. Aug. 1950. 15p. (ISC-129)

The energy distribution produced by scattering of monoenergetic electrons by air in a cloud chamber was plotted, and from this distribution the amount of scattering in the gas was estimated. The monoenergetic electrons were produced in a thin foil by the photoelectric effect by γ rays from a radioactive source. The results were compared with theory and found to differ widely. (auth)

3249

THE ANGULAR CORRELATION OF PHOTO-ELECTRONS EJECTED BY ANNIHILATION QUANTA. Frank L. Hereford. Phys. Rev. 81, 482(1951) Feb. 1. (Letter to the editor)

Information on the directional distribution of photoelectrons produced by polarized quanta of relatively high energy is

presented. A method suggested by Pryce and Ward (Nature 160, 435(1947)) is used as a basis for this experiment. A source of positrons (Cu^{64} or Na^{22}) sealed in an Al capsule was placed at the mid-point of a ⅜-in. hole drilled through a 7-in. Pb cylinder. The beams of annihilation quanta emerging from the hole impinged upon two thin-walled Pb cylinders. Photoelectrons ejected in planes perpendicular to the radiation beams were detected by two end-window G-M counters. The experiment proper consisted in the observation of the coincidence rate as a function of the minimum relative azimuthal orientation of the counter axis. The counters were rotated a full 360 deg in periodic 90-deg steps.

3250

DETERMINATION OF THE QUALITY OF X-RAYS. Samira M. Aly. Proc. Math. Phys. Soc. Egypt 4, 41-51(1949) May.

Two air-wall ionization chambers were used for the direct measurement of I_x/I_0 (intensity of the beam before and after it passed through each filter) for a set of beams of x rays of different quality. Absorption curves were constructed, and the half-value layers of the beams were determined. The energy distribution curves were calculated from the Silberstein-Jones formula for beams (Silberstein, Phil. Mag, (7) 15, 375(1933); Jones, Brit. J. Radiology 13, 110(1940)) where the formula fits the absorption data obtained. A comparison was made between the results obtained from the measurement by a Siemen's ionization chamber and dosimeter and those obtained from the above method. (auth)

3251

Office of Naval Research, London
DETERMINATION OF THE SCATTERING CONSTANT IN PHOTOGRAPHIC EMULSIONS. S. Fred Singer. Jan. 8, 1951. 3p. (ONRL-3-51)

The scattering constant for photographic emulsions has been redetermined at Bristol, England, by means of residual range and scattering measurements. A value of 27.3 ± 0.6 is obtained, which is significantly lower than the value 32.7 previously used in the Bristol work. (auth)

3252

THE DISPERSION FORMULA [FOR THE SCATTERING OF NEUTRONS BY LIGHT NUCLEI]. Jean Humblet. Compt. rend. 231, 1436-7(1950) Dec. 18. (In French)

A formula for the elastic scattering cross section was given by Siegert (Phys. Rev. 56, 750(1939)) which is valid only in the neighborhood of the narrow virtual energy levels of the neutron-plus-nucleus system. The present paper gives a formula uniformly convergent for any value of neutron kinetic energy.

3253

INELASTIC SCATTERING OF DEUTERONS BY C^{12}. K. K. Keller, J. B. Niedner, C. F. Wang, and F. B. Shull. Phys. Rev. 81, 481-2(1951) Feb. 1. (Letter to the editor)

A heavy-particle magnetic spectrometer has been used to determine the momentum distribution of deuterons scattered by thin carbon targets. Two types of targets were used, a 0.2-mil foil of nylon and a very thin foil of Al on which C had been unavoidably deposited during bombardment. The C targets were bombarded by a collimated beam of 10-Mev deuterons from the Washington University cyclotron. The spectrum of deuterons scattered by the nylon target shows three closely spaced groups scattered elastically by C^{12}, N^{14}, and O^{16}. A fourth group appears in the vicinity of 3.7×10^5 gauss-cm. These deuterons were scattered by C^{13}, leaving the C nucleus in an excited state. This inelastic peak was restudied using the Al-borne C deposit as a target. No evidence was found for lower excited states of C^{12}.

3254

ON THE DEPOLARIZATION OF ELECTRONS BY MULTIPLE SCATTERING AND REFLECTION-TRANSMISSION EFFECT. Norio Ryu. J. Phys. Soc. Japan 5, 423-8(1950) Nov.-Dec.

In some experiments on the polarization of electrons, there is a discrepancy between results and theory. The effect of multiple scattering, as a depolarization factor, cannot explain the discrepancy. As another cause of the discrepancy, the plural scattering, which is the combination of two rather large angle deflections in the same foil, is considered in some detail. Such a plural scattering gives rise to values of the so-called "reflection-transmission" effect agreeing with experimental results. It is shown that the negative experimental results obtained elsewhere can be accounted for if this effect is taken into account. (auth)

3255

ON THE DISTRIBUTION OF NEUTRONS IN A MODERATOR. P. Janssens and A. Gribaumont. Bull. classe sci. Acad. roy. Belg. (5) 36, 616-26(1950) Aug. 1. (In French)

By using a generalized form of Langevin's method (Compt. rend. 214, 517(1942)), the authors calculate the distribution of slow neutrons, in space and according to energy, in an infinitely large moderator in which no captures take place. The same problem is solved by generalizing the integral equation of Flügge (Z. Physik 111, 109(1948)) applied to a moderator of arbitrary mass. Both methods yield strictly identical results. Since the generalized Flügge equation can be used also in a theory of a capturing moderator, a calculation of that kind is made for the case of a hydrogen moderator. (auth)

3256

ON THE MULTIPLE SCATTERING OF FAST ELECTRONS IN ALUMINUM. Stig Brimberg. Arkiv Fysik 2, No. 5, 461-9(1951) Jan. 25. (In German)

Multiple scattering of carefully collimated β rays (primary β rays of P^{32}), occurring during the passage through Al foils of various thicknesses, was examined using thicknesses $x = 21$ to 1270 μ. In accordance with Bothe's calculations (Z. Physik 54, 161(1929)), the most probable scattering angle, in the range $x = 21$ to $x \approx 350$ μ, is proportional to $x^{3/2}$ and has a maximum value of 33.2 ± 0.8 deg. The value for the mean energy of the β emission of P^{32}, as measured by Siegbahn (Phys. Rev. 70, 127(1946)), agrees with that found by applying the formula of Goudsmit et al. (Phys. Rev. 57, 24(1940); 58, 36(1940)) to the results of experiments with thin foils described in the present paper.

3257

ON THE PRODUCTION OF POLARIZED HIGH ENERGY X-RAYS. M. May and G. C. Wick. Phys. Rev. 81, 628(1951) Feb. 15. (Letter to the editor)

An examination is made of the possibility of experiments with polarized x rays of high energy, the polarization being obtained by using only a portion of the x-ray beam emitted (by a betatron, synchrotron, or linear-accelerator target) at an angle to the direction of the electron beam. The polarization expected in this off-center radiation is in a sense the analogue of the well-known polarization of ordinary bremsstrahlung when observed at right angles to the electron beam.

3258

RANGES OF THE TWO FRAGMENTS OF URANIUM FISSION IN PHOTOGRAPHIC EMULSION. Leopold Vigneron. Compt. rend. 231, 1473-5(1950) Dec. 18. (In French)

The mean paths of the two fragments and the mean path of the pair of fragments in Ilford E_1 emulsion are: $L_1 = 10.4\ \mu$, $L_2 = 13.4\ \mu$, $L = L_1 + L_2 = 23.8\ \mu$. The mean-square deviation about the mean value is $1.0\ \mu$ for the individual fragments and $1.4\ \mu$ for the pair.

3259

SPATIAL AND ENERGY DISTRIBUTION OF NEUTRONS IN A CAPTURING MODERATOR. M. Demeur. Bull. classe sci. Acad. roy. Belg. (5) 36, 627-38(1950) Aug. 1. (In French)

The neutron distribution is calculated for a moderator in which neutron captures take place, the moderator being supposed to surround uniformly the source. The method used is an approximation procedure especially suitable for the case of moderators of large mass. Another calculation yields the probability of survival of a neutron in such a medium after a given number of collisions. (auth)

RADIATION EFFECTS

3260

Oak Ridge National Lab.
THE EFFECT OF REACTOR IRRADIATION ON THE STRESS STRAIN CURVE OF COPPER. T. H. Blewitt and R. R. Coltman, Jr. [nd.] Decl. Mar. 2, 1951. 4p. (AECD-3095; CF-51-2-94)

Single crystals of 99.999% Cu were vacuum annealed for 3 hr, then were pile irradiated (2×10^{18} nvt) for 4 weeks. A stress-strain curve taken on a 120,000-lb tensile machine shows that the irradiation caused an increase in the critical shear stress of about 1000%. Irradiation after cold work produced only a slight increase in hardening. The mechanism of radiation hardening is discussed briefly. Radiation damage does not have a one-to-one correspondence with cold work. It rather appears to bear a somewhat more analogous approach to solid-solution hardening.

RADIOACTIVITY

3261

Radiation Lab., Univ. of California
THE URANIUM ISOTOPE U^{236}. A. Ghiorso, J. W. Brittain, W. M. Manning, and G. T. Seaborg. Dec. 20, 1950. Decl. Mar. 22, 1951. 2p. (AECD-3106; UCRL-1063)

The report is reproduced here in its entirety.

Following the early observation that U^{235} captures slow neutrons to an appreciable extent in competition with the fission reaction, an attempt was made to detect the expected α particles from the resultant U^{236}, and the negative result led to the placement of a lower limit of 3×10^5 yr for this half-life (Anderson and Nagle, Manhattan Project Metallurgical Laboratory Report CP-1389, p.10, Feb. 1944). A little later the isotope U^{236} was detected with the mass spectrograph (Williams and Yuster, Los Alamos Scientific Laboratory Report LAMS-195, Jan. 1945) in a sample of enriched U^{235} which had been irradiated with slow neutrons in the U chain-reacting pile. In the summer of 1945 a sample of enriched U^{235} which had been strongly irradiated with slow neutrons became available for measurements of the α radiation. Measurements with the α-pulse analyzer apparatus on a chemically purified U indicated α-particle activity of energy about 4.5 Mev (i.e., slightly greater than that of the main group of U^{235} α particles) with intensity about half as great as that of the U^{235}. This corresponded to an α half-life for U^{236} of about 2×10^7 yr. Measurements a little later on another sample similarly prepared containing approximately [?] U^{236} by weight, led to the same result. This α-particle energy corresponds very well with that expected for U^{236} from the α systematics. The half-life is just that expected for a nucleus of atomic number 92 of the even-even type, in which case the decay is not prohibited. The isotope U^{236} is, of course, expected to be β stable.

3262

Argonne National Lab.
THE RADIATIONS FROM HAFNIUM. S. B. Burson, K. W. Blair, H. B. Keller, and Sol Wexler. Jan. 25, 1951. 25p. (AECU-1147; UAC-345)

Results of investigations by spectrometric, spectrographic, absorption, and coincidence methods of the 70-day, 45-day, and 5.5-hr activation of Hf are reported. From activation experiments on separated Hf isotopes, the following assignments have been made: 70-day, Hf^{175}; 5.5-hr, Hf^{180}; and 45-day, Hf^{181}.

3263

Argonne National Lab.
ON THE TYPE OF INTERACTION IN β-DECAY. Steven A. Moszkowski. Jan. 26, 1951. 3p. (AECU-1156; UAC-343)

An analysis is presented of the type of interaction responsible for β decay. The work is based on the premise that the β-decay interaction may be a linear combination of several types of interaction. From the arguments it is indicated that β decay is primarily determined by a Gamow-Teller interaction with an additional amount of Fermi interaction. Special cases are cited where β decay would be determined entirely by a Gamow-Teller interaction plus an unknown amount of pseudoscalar interaction.

3264

Brookhaven National Lab.
STUDY OF LOW ENERGY GAMMA RADIATIONS EMITTED

FROM Pa^{231} AND U^{234}. Gertrude Scharff-Goldhaber and Michael McKeown. Feb. 7, 1951. 9p. (AECU-1191)

Investigation by means of argon-filled proportional counters, which are illustrated, has proved that the low-energy γ radiations associated with the α decay of U^{234} and Pa^{231} are L x rays of Th and Ac. It is shown that about 30% of the α particles from U^{234} are followed by strongly converted γ rays of energies ranging from 50 to 90 kev. A 27-kev γ ray responsible for most of the L x rays from Pa^{231} was found. A systematic study of the occurrence of low-energy γ rays is now in progress.

3265

Brookhaven National Lab.
RADIATIONS FROM IODINE 126. M. L. Perlman and G. Friedlander. [nd.] 5p. (AECU-1205)

Preliminary results of an investigation of the decay scheme of I^{126} are reported. The ratio of the electron-capture probability to the β-decay probability for I^{126} was found to be 1.44 ± 0.15. β-ray spectrometer measurements demonstrated, in agreement with earlier data, the existence of two β transitions of energies 1.24 ± 0.02 Mev (~25%) and 0.85 ± 0.03 Mev (~75%) and of conversion electrons of a 0.382 ± 0.004-Mev γ ray. A 640 ± 20-kev γ-ray line was found, low in intensity compared with the previously known 390-kev line. In addition, a faint line was observed of energy corresponding to annihilation radiation. A preliminary estimate of 2% positron decay may be deduced from coincidence data. The 1.24-Mev β rays do not coincide with γ rays and therefore presumably go to the ground state of Xe^{126}. The 0.85-Mev β rays are followed by a single γ-ray transition, probably the observed 0.38-Mev γ ray. The γ-γ coincidences and the 640-kev γ ray must therefore be in the electron-capture branch.

3266

Brookhaven National Lab.
BETA AND GAMMA RADIATION OF Al^{28} AND THE MASS OF Al^{27}. (abstract) H. T. Motz. Mar. 1, 1951. 1p. (AECU-1216)

The report is reproduced here in its entirety.

The spectrum of 2.3-min Al^{28} has been studied using samples activated in the Brookhaven nuclear reactor and a lens spectrometer with a resolution of 2%. A γ-ray energy of 1.785 ± 0.015 Mev has been found by external conversion in a U foil. The β spectrum from a 2 mg/cm^2 source has been fitted to a Kurie plot for an allowed transition from approximately 1 Mev to the end point. The end point has been found to be 2.83 ± 0.03 Mev. No β transition to the ground state of Si^{28} has been observed. Such a transition is less than 2% of the observed β decay to the excited state. These results are in general agreement with previous studies of Al^{28}. The observed total disintegration energy of 4.615 ± 0.035 Mev does not agree with the writer's calculations of the Al^{28} and Si^{28} masses (Phys. Rev., in press) but is in good agreement with recent reaction data obtained at Massachusetts Institute of Technology (D. M. Van Patter, private communication). A more consistent set of masses from Ne^{20} to S^{32} results from an Al^{27} mass approximately 0.2 mμ higher than the value 26.98983 ± 0.00008 given by Ewald and Mattauch (Physik. Z. 44, 181(1948)).

3267

Brookhaven National Lab.
MEASUREMENT OF γ-RAY ENERGIES WITH A SCINTILLATION SPECTROMETER. E. der Mateosian. Mar. 1, 1951. 1p. (AECU-1222)

The report is in abstract form and is reproduced here in its entirety.

A scintillation spectrometer especially useful for the study of energies of short-lived γ-ray emitters has been developed. The light output from a NaI (Tl activated) crystal is recorded with the help of a DuMont oscilloscope and a Polaroid camera. Some of the results of interest are the following. The β emitter Ti^{51} (6 min) shows the same γ rays as the K capturer Cr^{51} (26 day). In both cases a 320-kev state of V^{51} is excited. Mo^{101} (14.5 min) and its daughter Tc^{101} (15 min), which had both been reported (see K. Way et al., "Nuclear Data," National Bureau of Standards Circular 498) to have a γ ray of 300 kev are found to possess γ rays of 150 and 260 kev, respectively. Nb^{94m} (6.6 min) for which a weak γ ray of 1.3 Mev had been reported (probably following a weak β branch) is found to have a γ ray of 0.9 Mev.

3268

Purdue Univ.
ISOMERISM OF In^{110}. E. Bleuler, J. W. Blue, and A. C. Johnson. [nd.] 1p. (AECU-1240)

The report is reproduced here in its entirety.

The $(\alpha,3n)$ reactions with $Ag^{109,107}$ lead to activities of 66-min and ~5-hr half-life (Goshal, Phys. Rev. 73, 417(1948)). The former is assigned to In^{110}, the latter to In^{108}. On the other hand, the reaction $Cd^{106}(d,2n)In^{106}$ results in an activity of 55 min (Mallary and Pool, Phys. Rev. 76, 1454(1949)). The discrepancy has been removed by showing that the longer period belongs to an isomer of In^{110}. The ground state (66 min) decays by positron emission (2.25 Mev) to an excited state of Cd^{110} at 654 kev. The decay of the conversion line emitted from this level was followed in a double-coil lens-type spectrometer and found to follow periods of 66 min and 4.9 hr. The latter must be assigned to an isomer. It decays chiefly by electron capture to a highly excited state of Cd^{110}. In addition to the 654-kev γ ray, conversion lines due to transitions of 937 and 887 in Cd^{110}, known to be in cascade from the decay of Ag^{110}, are found. The isomeric transition to the ground state (119 kev) is very weak and seems to belong to the $l = 4$ class.

3269

Argonne National Lab.
BETA DECAY OF 7.5-DAY Ag^{111} TO A 0.1 MICROSECOND EXCITED STATE OF Cd^{111}. Donald Engelkemeir. Mar. 1951. 4p. (AECU-1248, UAC-364)

A careful search has been made for delayed coincidences in Ag^{111}. Stilbene scintillation counters with 1P21 photomultipliers cooled with liquid N_2 were employed to detect the radiations. The β crystal was so thin (~20 mg/cm^2) that its efficiency for γ rays was negligible. A plot of the coincidence rate vs. delay time is shown. The main body of the transitions shows no delay greater than 0.02 μsec. A small fraction of the transitions are delayed with a half-life

of 0.10 ± 0.02 μsec. Since nearly equal counting efficiencies for the two γ's are expected, it may be calculated that the ratio of the undelayed to delayed transitions is about 6:1. The identification of the 243-kev level in Cd^{111}, formed by β decay of Ag^{111}, with the 0.09-μsec level observed in the K-capture decay of In^{111} and in the 48-min isomeric transition of Cd^{111*} thus appears to be justified.

3270

Argonne National Lab.
GAMMA-RAYS IN THE DECAY OF EUROPIUM 152, ERBIUM 171, AND ERBIUM 169. (abstract) H. B. Keller and J. M. Cork. Mar. 13, 1951. 1p. (AECU-1268; UAC-366)

The report is reproduced here in its entirety.

Spectroscopically pure samples of Eu and Er were bombarded in the Argonne heavy-water-moderated nuclear reactor, and examined in a permanent-magnet-type photographic β spectrometer. The γ rays deduced from the observed electron line spectra are summarized in the table which follows:

Radio-isotope	γ rays	Mode of decay	Half-life
Eu^{152}	121.9; 344.1	K capture and β emission	9.2 hr
Er^{171}	112.8; 117.9; 125.5; 176.4; 294.5; 307.5; 419.7	β emission	7.5 hr

No γ rays were found to be associated with the 9.4-day activity in Er^{169}. This confirms the previous hypothesis of other investigators.

3271

Oak Ridge Inst. of Nuclear Studies
TABLES TO CORRECT FOR PHYSICAL DECAY OF SOME FREQUENTLY USED ISOTOPES. H. D. Bruner, E. R. King, and Mary P. Smyser. [nd.] 50p. (ORO-26)

The tables are arranged to provide the value of $e^{-\lambda t}$ to four places for time interval t. The value for $e^{-\lambda t}$ is then used in the expression $N = N_0 e^{-\lambda t}$ in the usual manner, where N_0 = the original radioactivity, and N = the activity after the time interval t.

3272

THE BETA-SPECTRUM OF Tc^{99}. S. I. Taimuty. Phys. Rev. 81, 461-2(1951) Feb. 1. (Letter to the editor)

The β spectrum of Tc^{99}, obtained from thin sources, was measured with a double thin-lens magnetic spectrometer. The sources of Tc^{99}, in the form of NH_4TcO_4, ranged in thickness from 0.17 to 1.3 mg/cm². Fermi plots of the thin-source data are presented.

3273

HALF-LIFE OF BROMINE-82. F. P. W. Winteringham. Nature 167, 155(1951) Jan. 27. (Letter to the editor)

The half-life of Br^{82} has been determined as 35.1 ± 0.13 hr. Br^{82} was extracted from monobromobenzene irradiated in the Harwell pile. The possibility of an error in previous half-life measurements due to S^{35} activity is discussed.

3274

THE HALF-LIFE OF Na^{24}. J. H. Sreb. Phys. Rev. 81, 469(1951) Feb. 1. (Letter to the editor)

Na^{24}, used as a check on the development of precise methods of measuring half-lives, is found to have a half-life of 15.060 ± 0.039 hr. This is not in accord with the findings of Wilson and Bishop (Proc. Phys. Soc. (London) 62A, 457(1949)), who have reported a value of 14.90 ± 0.02 hr. A detailed explanation of their alleged error and a recalculated half-life value using their published data are presented.

3275

NATURAL RADIOACTIVITY OF LANTHANUM. Uspekhi Fiz. Nauk 42, 323-4(1950) Oct. (In Russian)

A note on the discovery by Pringle et al. (Phys. Rev. 78, 303(1950)) of the 1.2×10^{11}-yr decay of La^{138}, as required by the rule of isobars of neighboring atomic numbers, is presented.

3276

ON SOME PECULIARITIES OF THE PROCESS OF THE FISSION OF THE HEAVY NUCLEI; trans. from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 10, No. 4 (1946). Ya. A. Frenkel. 1946. 15p. (NP-2256)

An abstract of this paper which appeared in Chem. Abstracts 43, 6914f(1949) is reproduced here in its entirety.

The asymmetrical fission of heavy nuclei is a result of the dependence of the probability of the tunnel effect on the effective mass of the two fragments. The variation of activation energy with degree of asymmetry is considered. The probability of the tunnel effect is calculated as a function of the excitation energy or temperature of the nucleus and compared with the probability of α decay. The emission of secondary neutrons is treated as the partial evaporation of daughter nuclei owing to high temperature and to the relatively low binding energy. The fact that they fly off in a highly excited state is due to their marked deviation from the spherical shape.

3277

SPONTANEOUS FISSION IN Cm^{242}. G. C. Hanna, B. G. Harvey, N. Moss, and P. R. Tunnicliffe. Phys. Rev. 81, 466-7(1951) Feb. 1. (Letter to the editor)

Brief note is made of the observation of the spontaneous fission of Cm^{242}. The fission rate was measured as 6.2/min per 10^8 Cm^{242} α disintegrations/min. The fission half-life was determined to be $(7.2 \pm 0.2) \times 10^6$ yr.

SHIELDING

3278

Battelle Memorial Inst.
DIMENSIONAL STABILITY OF MAGNESIUM OXYCHLORIDE CEMENTS AND CONCRETES. M. J. Snyder, C. A. Burkart, and J. W. Clegg. July 1950. Decl. Mar. 12, 1951. 49p. (AECD-3079; BMI-T-45)

Tentative conclusions concerning the effects of compositional variations on the stability of magnesium oxychloride cements

and concretes on the basis of tests after 2 months of storage have been confirmed, in general, by tests conducted after a 1-yr storage period. Grades of magnesia which resulted in cements and concretes of the greatest stability after 2 months storage also yielded stable products after 1 yr of storage. The following grades were most effective in this respect: Westvaco Special, Westvaco SFN-194, Westvaco 35-hr, and dead-burned magnesite. The compressive strength of cements and concretes prepared from these magnesias was not diminished appreciably by storage and, in some cases, was appreciably increased. A $MgCl_2$ concentration of 26° Bé. was optimum on the basis of stability measurements after 1 yr of storage. The addition of Calgon (sodium hexametaphosphate) to Mg oxychloride concretes improved the stability of the concrete on storage and, in some compositions, increased the resistance to weathering. Indications were obtained that the increased weathering resistance is not sufficient to permit exposure to weather for periods much longer than 1 yr, however. Other additives, such as set cement, Colemanite, asbestos, or polyvinyl acetate, had little stabilizing action. (auth)

3279

Brookhaven National Lab.
GAMMA RAY SHIELDING FOR ENGINEERING REFERENCE. John M. Ruddy. Feb. 15, 1951. 44p. (AECU-1211)

Data are provided for computing γ-ray attenuation through medium and heavy shields of Pb, Fe, or concrete—for light shields or nuclides with very weak γ rays, a check for β-ray protection is advisable. For higher-energy γ rays—over 10 Mev—and for sources emitting an appreciable quantity of neutrons, both exceptional cases, a separate determination of shielding attenuation for mesons and fast and/or thermal neutrons and their secondary effects should be made. Other than this, γ-ray shielding described herein will, in general, adequately shield from other rays or particles. Although the literature covering the theoretical and experimental behavior of γ rays penetrating shielding material is not complete in the higher-energy ranges above 5 Mev, or for heavier layers of absorbers, sufficient data were obtained to prepare simplified equations, tables, and charts for engineering practice after the present basis for γ-shielding computations was brought into agreement with the latest observations and theoretical data. (auth)

SPECTROSCOPY

3280

Argonne National Lab.
A NEW TYPE OF SHORT WAVELENGTH ABSORPTION BAND IN ALKALI HALIDES CONTAINING COLOR CENTERS. Charles J. Delbecq, Peter Pringsheim, and Philip Yuster. Jan. 10, 1951. 15p. (AECU-1155; UAC-338)

Photochemically and additively colored potassium iodide crystals exhibit new absorption bands in the ultraviolet which do not have the characteristic properties of V-bands. An interpretation of the origin of these bands is proposed. (auth)

THEORETICAL PHYSICS

3281

Brookhaven National Lab.
CHARGE RENORMALIZATION IN THE HARTREE APPROXIMATION. Hartland S. Snyder. Feb. 20, 1951. 3p. (AECU-1204)

The Hartree approximation of replacing the electron-positron current operator by its expectation value is used in the field equations and canonical commutation relations of the Dirac-Maxwell fields in carrying out the charge and field renormalization.

3282

Research Lab. of Electronics, Mass. Inst. of Tech.
THE QUANTUM THEORY OF ANTIFERROMAGNETISM. (Technical Report No. 172). R. J. Harrison. Aug. 31, 1950. 32p. (NP-1929)

Recent neutron-diffraction experiments on antiferromagnetic crystals at low temperatures indicate the existence of a long-range correlation in direction of the spin magnetic moments. Although the Ising model predicts such a correlation, a consideration of the uncertainty relationships for spin shows that in the correct quantum description of an antiferromagnet, the ordering cannot be the simple type given by this semiclassical model. The problem of determining the lowest quantum state of an antiferromagnet is much the same as the quantum-chemical problem of determining the state of a large molecule. The short-range correlation of spin moments is measured by a quantity called the "bond order" in molecular problems. This assumes its maximum in the lowest eigenstate. In an attempt to make progress in solving the general quantum-mechanical problem, a new method of approximation has been developed and applied to the linear antiferromagnetic chain. The spin eigenfunction is expanded in terms of a set of "valence bond spin functions," grouped according to "degree of excitation." The amplitudes for each excitation are determined by the solution of an infinite set of linear difference equations. (auth)

3283

Arthur D. Little, Inc.
TECHNICAL REPORT NO. 4; STOCHASTIC METHODS IN QUANTUM MECHANICS. Gilbert W. King. Feb. 1, 1950. 27p. (NP-3007)

The lowest stationary state $\psi_0(\xi)$ can be found by repeated application of the Hamiltonian on an arbitrary state, averaging over a time of appropriate length. This may be done by the transformation $t = iht$ on the time-dependent Schroedinger equation, to get Ulam's form $\partial u/\partial t = \Delta^2 u - Vu$, where $u = \psi(\xi)e^{-2t}$ in time reaches the configuration $\psi_0(\xi)$, the amplitudes decaying with a logarithmic decrement equal to the lowest energy. A solution of this "diffusion" equation can be found by a stochastic process, the points in ξ,t space moving $\Delta\xi$ in time Δt by a random process, and increasing in weight at each step by $e^{-V\Delta t}$. If all possible random walks were to be taken, the final distribution would be precisely that obtained by iterative methods of solving

the corresponding difference equation. If the step function, $x_n = n \Delta x$ be replaced by orthogonal functions, the diffusion process occurs in a Hilbert space, and if all random walks are taken, the process becomes that of iterating the Heisenberg matrix on an arbitrary vector. Excited states can be obtained by imposing nodes where "particles" become annihilated. The method is illustrated by the harmonic oscillator and particle in a box. (auth)

3284

THEORIE UND LÖSUNGSMETHODEN DES MEHRTEILCHEN-PROBLEMS DER WELLENMECHANIK. P. Gombas. Basel, Birkhäuser, 1950. 268p. (In German)

An exposition of that division of quantum mechanics which treats of many-particle problems is presented, the subject matter being further limited to a survey of methods of calculation of ground states only. A more complete review may be found in Naturwissenschaften 38, 103(1951).